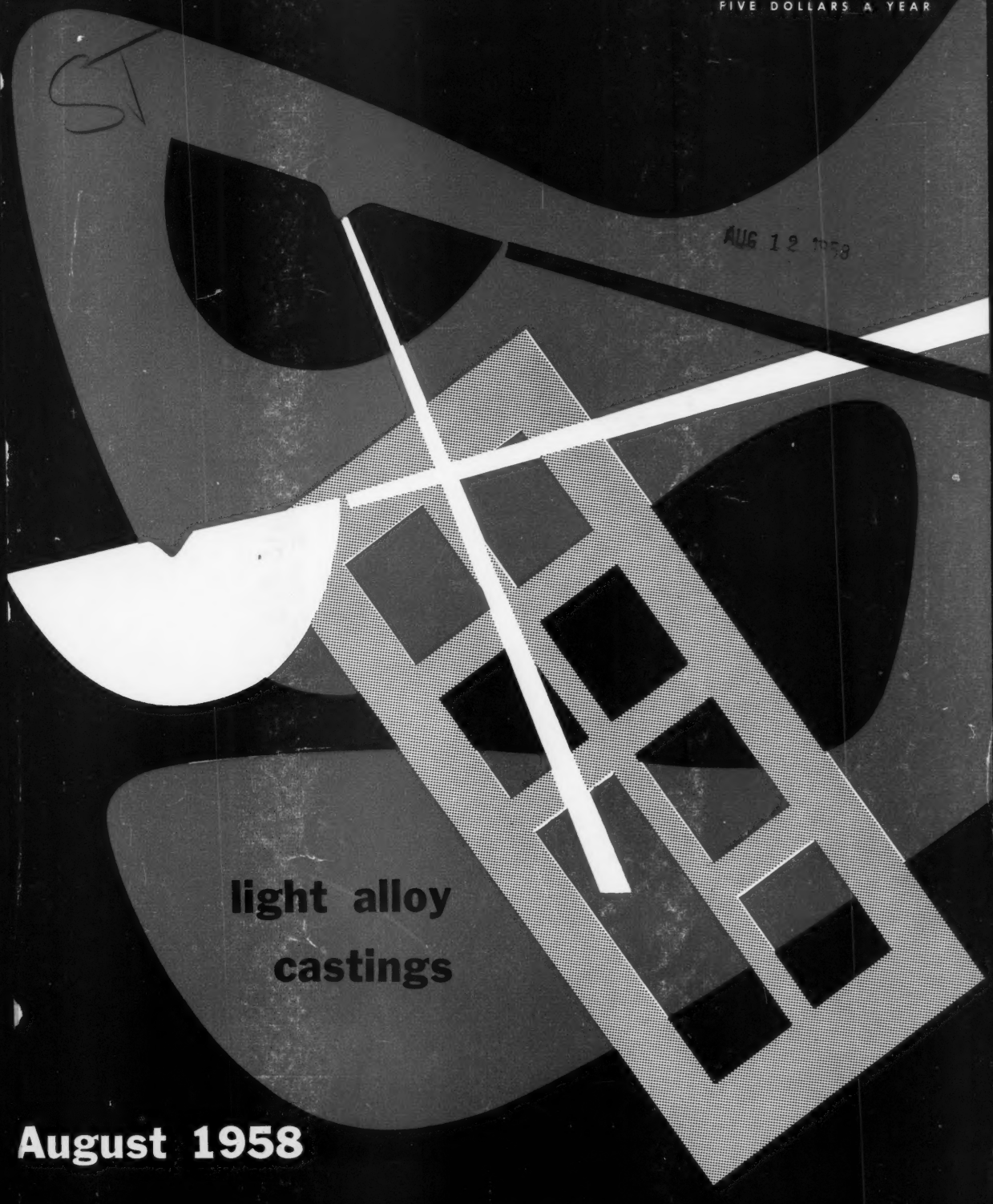
Design Engineering

FIVE DOLLARS A YEAR



light alloy castings

August 1958

PUBLISHED BY THE MACLEAN-HUNTER PUBLISHING COMPANY LIMITED, TORONTO, CANADA

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...that gives me an idea!"

"Non-rusting...attractive...durable!
That's a combination I need for MY business"

Aluminum castings are showing up everywhere these days. Automobiles, for example, now have cast aluminum pistons and carburetors, and aluminum die castings in their automatic transmissions. Manufacturers know that cast aluminum brake drums give improved braking. Alcan has been supplying carefully engineered aluminum castings to Canadian industry for over 25 years.

PERHAPS ALCAN ALUMINUM AND ALCAN "KNOW HOW" CAN HELP YOU IN YOUR BUSINESS . . .

ALCAN are the people to see about everything concerning aluminum. They are leaders in its development and set its standards of quality. ALCAN has over fifty years' experience in aluminum and is the major source in Canada for sheet, wire, rod, bar, foil, extrusions, castings and ingot.

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AUGUST 1958

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The story behind this issue

Those of you who got the message from the front cover will realize that the August issue puts heavy emphasis on the subject of light alloy casting. Our object here was to gather together under one cover as much information as possible on sand, die and permanent mold castings in aluminum and magnesium. As a design engineer you have a tough problem to retain in your mind current practices and keep abreast of the latest developments at the same time. An issue such as this should make a convenient reference source (and a compact one) on light alloy castings.

The series of articles has taken a large chunk of editorial time in its preparation. Needless to say, the staff of Design Engineering hopes that the information is not only worth while, but also in the most useful form for its purpose.

Let us know what you think. We propose to have similar collections of quickly digested reference material in future issues and some of the subjects now in preparation include: blind fasteners, hydraulics, centrifugal casting, nylon applications and so forth.

If you see a way in which the material can be made easier to absorb, tell us. If there are other fields on which you would like a similar treatment, tell us that too.

The information on light alloy castings which appears in this month's editorial pages was not assembled without a great deal of outside assistance and we wish to acknowledge some of the specialist engineers and many firms which kindly and freely gave help. Particularly would we like to thank the following who we consulted during the preparation of the issue: The Aluminum Co. of Canada, Canadian Steel Improvement Ltd., Chrysler Corp., Dominion Magnesium, Magnesium Co. of Canada, Volkswagen Canada.

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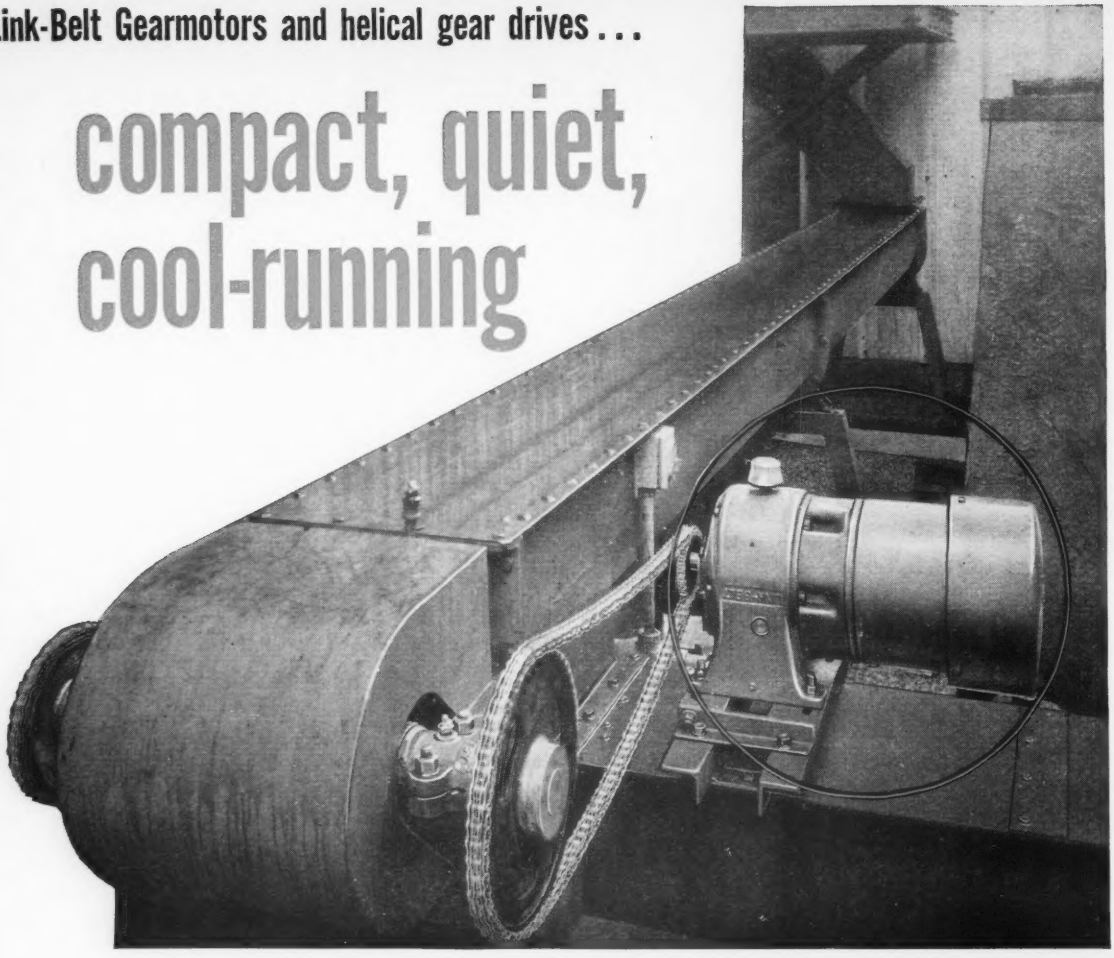
Link-Belt Gearmotors and helical gear drives . . .

compact, quiet, cool-running



LINK-BELT Gearmotors and helical gear drives are economical answers to efficient speed reduction in minimum space. Both feature these built-in advantages:

- **ANTI-FRICTION BEARINGS** on shafts withstand heavy loads, cut power requirements.
- **HOBBED HELICAL GEARS** are rigidly mounted for smooth, quiet action.
- **BUILT-IN POSITIVE BACKSTOP** available on all units.
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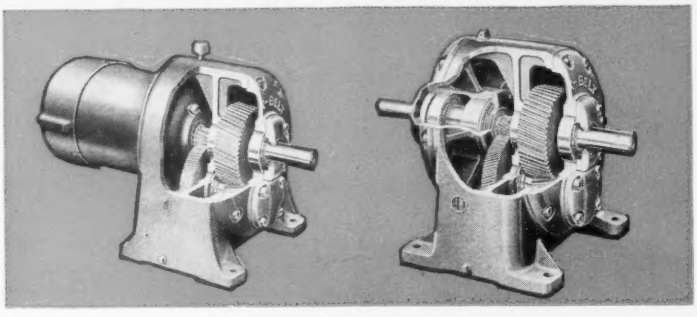
These drives are available for shipment from any of our factory branch stores. For details, contact your representative.

14,764

LINK-BELT

ENCLOSED DRIVES



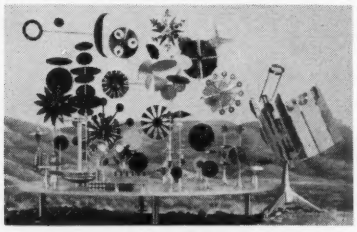
Link-Belt Gearmotors are composed of helical gear sets in a compact oil-tight housing. All units in various horsepowers and ratios are equipped with integrally mounted CEMA motors. Accurate alignment of motors and gears results in smooth operation plus maximum safety. For facts, write for Book 2247.

Link-Belt helical gear drives consist of double or triple sets of gears in dust and oil-tight housings, available in a wide range of horsepower capacities and speed ratios. Quality construction and thorough testing of all parts assure a drive which will give long, reliable service under heavy loads. Write for Book 2451.

Reports

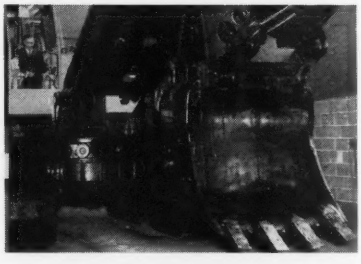
A news roundup of items of engineering and design interest from the world over

Sun-powered Rube Goldberg device shows off aluminum



Something to give a lift to any Rube Goldberg fan is this toy built by designer Charles Eames to demonstrate the possibilities of solar energy. Made of aluminum in many shapes and colors, the toy is powered by sunlight falling on an array of aluminum (Alcoa) panels and focused on to twin rows of silicon solar cells. The current generated (in excess of half a watt) is passed through electric motors spotted throughout the display. These set the colorful discs, moons, shafts and pinwheels into a rainbow of motion. The toy starts instantaneously and needs only the touch of a sunbeam to set the aluminum abstracts gliding into motion.

Quebec's Duplessis introduces giant power shovel

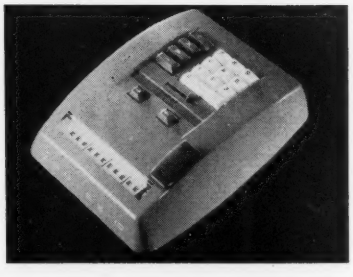


At a "let's pretend" session in Montreal recently, Quebec's Premier Duplessis took the controls of the largest power shovel designed and built in Canada.

Dominion Engineering's "550" has a 2½ cubic yard shovel and a lifting power, as a crane, of 51 tons. The unit represents an investment of a million dollars and five years of research in design, component and prototype testing.

At the introduction ceremony, Quebec's Premier said "There are some people who makes trips to Moscow to see what is going on there. They would be a lot better off if they came around to see what is going on in Quebec."

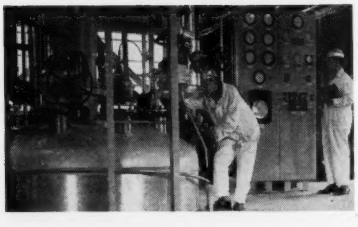
Scandinavian calculator looks at design afresh



An item to stir up a considerable commotion in the office equipment field is this new calculator from Scandinavian Business Machines Ltd. By taking a completely new look at its design, both from the point of view of appearance and function, its manufacturers have been able to do some interesting things.

Firstly, they have been able to cut their manufacturing costs to such an extent that the calculator retails for about $120 (well below other models of similar performance). It has a live keyboard with a short stroke actuating bar which does away with the cumbersome handle. The bar is depressed by the heel of the hand and the fingers remain poised over the keys. Ruggedly built, the calculator is factory guaranteed for five years.

Montreal plant Canada's first epoxy resin producer



Canada's first plant to produce epoxy-type resin went into production at Montreal East recently. Since their introduction to this country, these resins have found a very wide range of uses as finishes, adhesives for the aviation industry and in laminates and castings for electrical uses.

Our photograph shows an interior view of the Shell Oil Company's plant. An operator (left) checks process through a sight glass in the reactor kettle while another operator records temperatures from the control panel at right.

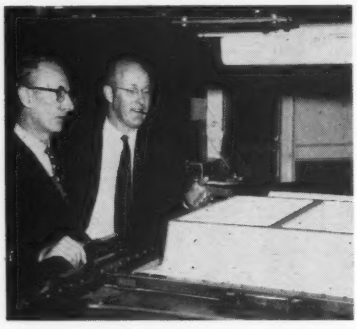
British 'brain' that works like a human clerk

Neat as a pin is this centre section of the largest electronic digital computer yet made in Western Europe for doing routine office work. For more than two years British designers and engineers have been working on this "brain" at their Berkshire laboratories.

The first model is to be exported to Sweden and later this year another model will be sent to South Africa. In Sweden "Perseus" will be used by an insurance company in Stockholm, where its first application will be the keeping of thousands of policy records. These will be recorded on reels of magnetic tape, from which the "brain" can rapidly provide up-to-the-minute figures.

An unusual feature of this electronic clerk is that it works like a human clerk directly with letters and numbers, no matter what language or currency.

Plastic door liners in one easy operation



Man at the left here is proud plant engineer Mervin H. Cody looking over a machine he designed to turn out neat door liners for the inside of refrigerators at the rate of one every minute.

Cody's machine got its start two years ago when he considered the idea of a rotary table that would heat, form and cool in one operation the door liners for refrigerators. In mid-57 he took his drawings to McClary's top management and explained the project. They were interested and gave him the go-ahead. Cody had his machine ready after six months of building and it went into operation at the beginning of this year. It has been running at full tilt ever since. "It has a very deep stroke," says Cody, "and this is a difficult engineering job to achieve at moderate cost. It's the only 3-stage machine in Canada . . . and that's quite something."

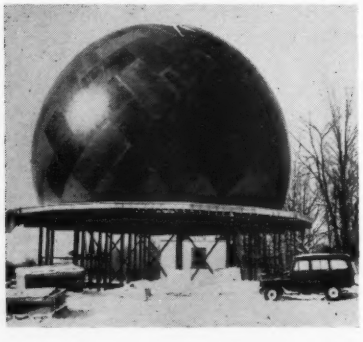
X-ray equipment prunes its weight and cost

Here's a natty cowhand all ready to mosey off and X-ray something. The unit is the lightest, highest voltage and least expensive per kvp portable X-ray equipment available for field and plant radiography according to its manufacturer, General Electric Co.

Among other things, the model offers effective radiation protection, unitized design, simplified controls and a dust and moistureproof head.

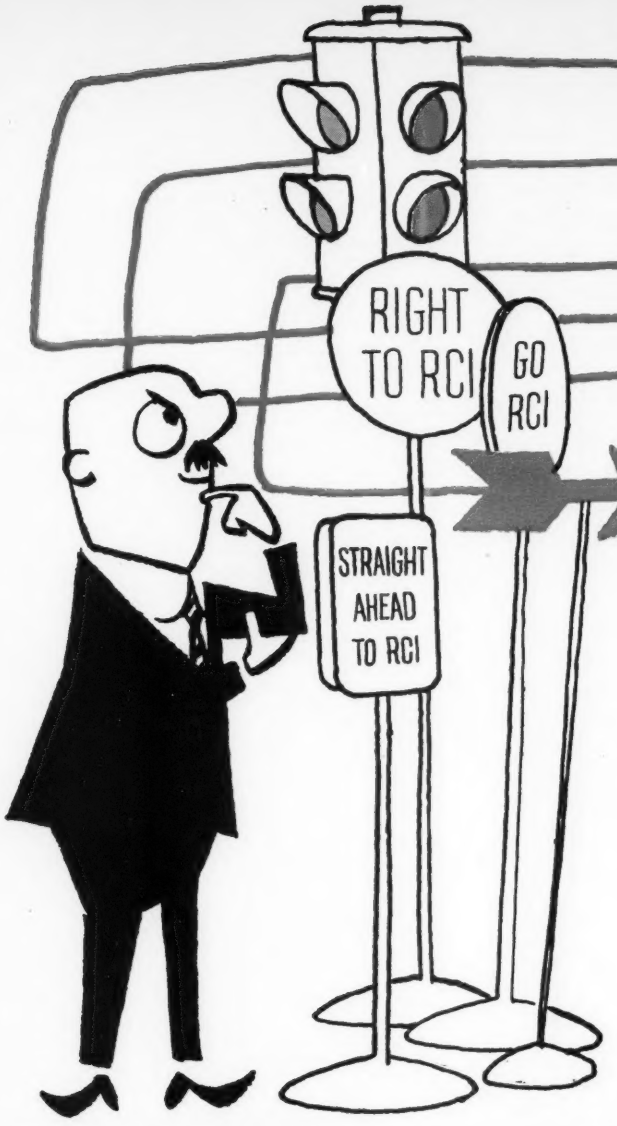
Radiographs with 2% sensitivity and 1.5 density can be produced with a 1½-minute exposure through 1¼ inches of steel. The tube head with guard frame weighs 46½ lb; the tube head control 25 lb; the case 40 lb. The durable plastic case has a cushioned interior for safe shipping and handling without special packing.

Epoxy jigsaw puzzle rises on the DEW line



Like a giant black mushroom in the snow, this 50-ft diameter spherical radome is said to be the largest structure built using glass fibre and epoxy resins. Superior to the standard geodesic radome in structural and electrical characteristics, the radome shown here is lightweight, fire and weather resistant, and will withstand winds up to 150 mph. Designed and built by Long Sault Woodcraft Co., the unit is for DEW line operation and other radar installations. Erection of the radome is fast. It takes six men only 1½ working days to fit together the intricately contoured panels like a jigsaw puzzle with simple locking devices.

The elimination of a frame which would interfere with the radar beams is one of the prime advantages of the new radome. The joints are arranged to cross the surface at 45 deg rather than vertically or horizontally. This means that panel joints do not interfere with either search or height finder radar sets.



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BUILT-IN ELECTRICALLY-CONTROLLED DIRECTIONAL VALVE

BUILT-IN DUAL SPEED CONTROLS

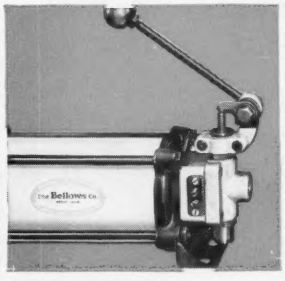
REQUIRES ONLY A SINGLE AIR CONNECTION

THE BELLOWS AIR MOTOR

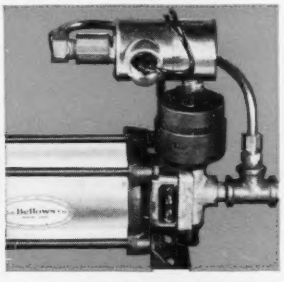
The Bellows Air Motor is a complete air cylinder power unit, with directional valve and speed controls built-in. Takes less than half the space and costs less installed than a conventional air cylinder set-up of equal power with its separate valving and piping. The single air connection, which can be made with flexible hose, makes it ideal for use on moving machine elements. It is a sturdy unit with forged steel heads, heavy brass cylinder, stainless steel piston rod. The piston rod is threaded, equipped with a wrench flat and nut. Many Bellows Air Motors have been operating day in and day out for fifteen years with negligible maintenance. And if service needs do arise, there is a Bellows Field engineer as near as your phone. The Bellows Air Motor shown above is a 2½" bore unit equipped with the Bellows Low-Voltage (8-12V) Electroaire Valve. Other bores available are 1¼", 1¾", 3⅝" and 4½". Any stroke length. Optional choice of built-in valves as shown below.

CHOICE OF BUILT-IN VALVES

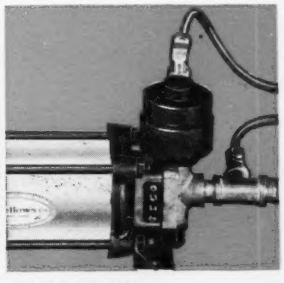
115 V. ELECTROAIRE VALVE
For J.I.C. applications where a 115 v. momentary contact is desirable.



MECHANICAL VALVE
For manual operation or for use with cams or direct linkage.



115 V. MAINTAINED CONTACT
Valve remains in shifted position during period current is applied.



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For use in applications calling for full pneumatic control.

Write for these two booklets

Fifty pages of data to help you select the right Air Motor-Valve combination for your job. Address Dept. DE 858, The Bellows Co., Akron 9, Ohio. In Canada: Bellows Pneumatic Devices of Canada, Ltd., Toronto 18. Ask for Bulletins BM-25 and SP-55.

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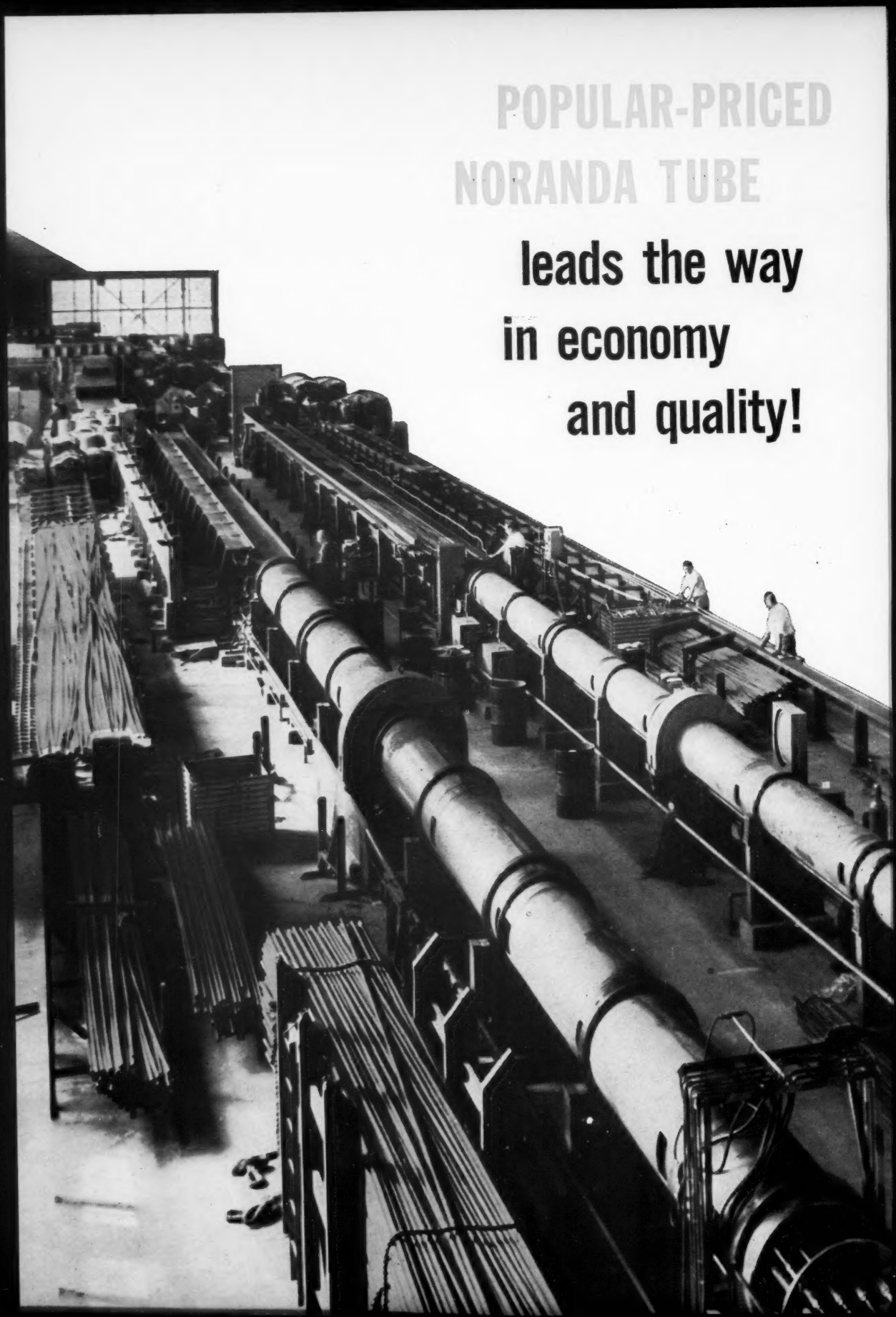
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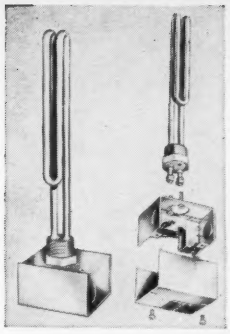
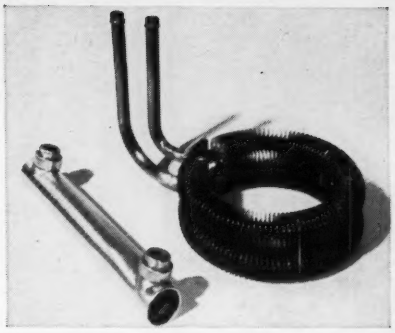
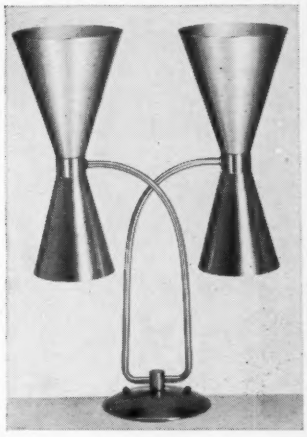
. . . SEE THE MAN FROM NORANDA



Proper temper and close I.D. and O.D. tolerances which are closer than commercial specifications, are called for in the Noranda tube used in this immersion heater made by The Canadian Chromalox Co., Ltd. Toronto, Ont.



Other examples of Noranda Tube in action . . . an automatic transmission cooling unit made of brass tube and a finned copper tube defroster coil made by McCord Corp. Windsor, Ont.



Top-quality surface finishes and easy workability are requisites for the Noranda tube used in this modern lamp, a product of Electrolier Mfg. Co. Ltd., Montreal.

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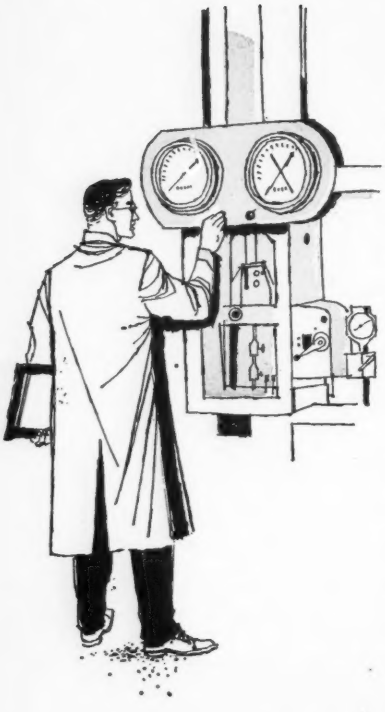

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Because experience has convinced our customers that Shawinigan's *full laboratory control* of every processing stage produces the finest corrosion and heat resisting castings in Canada.

Every casting produced by Shawinigan is closely checked and inspected at every stage of the process. X-ray tests, Gamma radiography, fluoroscopic examination of non-magnetic materials and magnaflux inspection of ferritic and martensitic type stainless steel . . . these are only some of the checks employed by Shawinigan.

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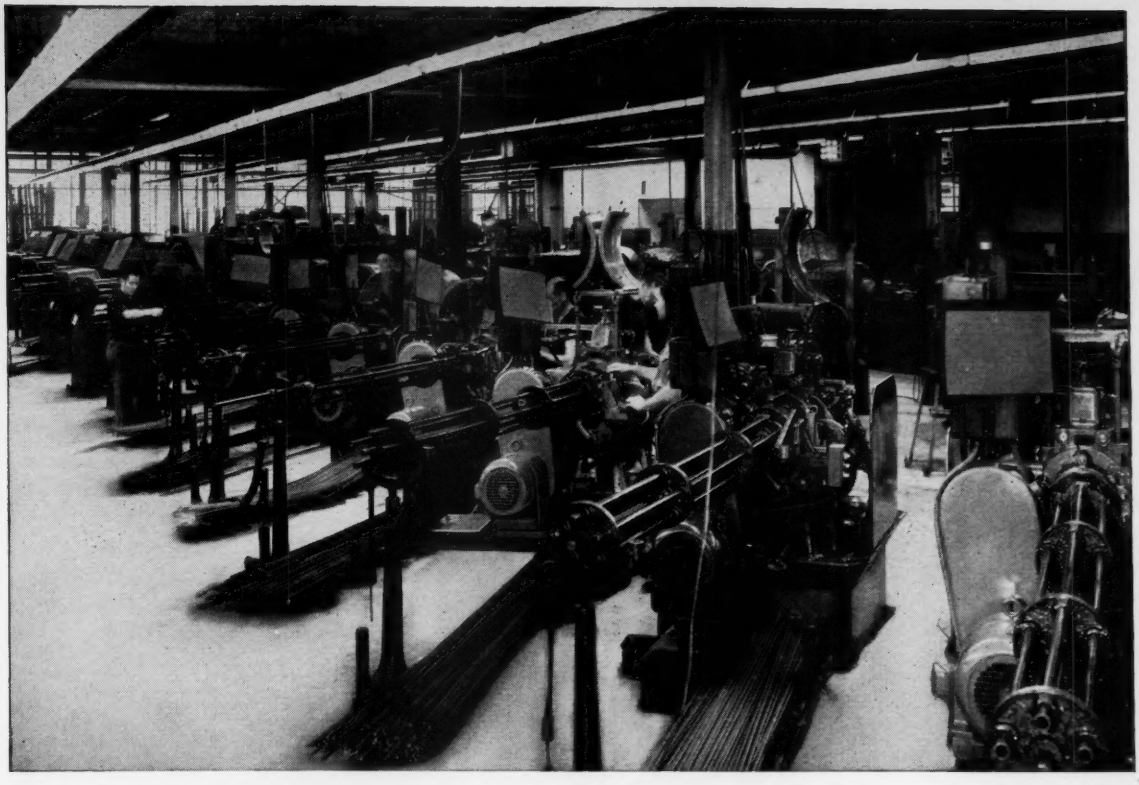

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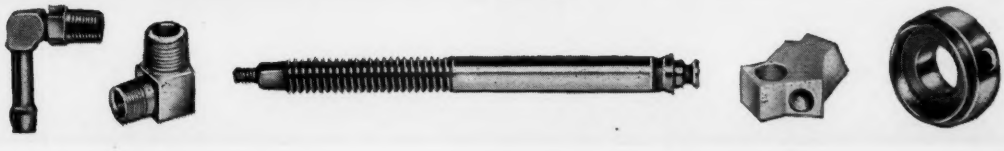
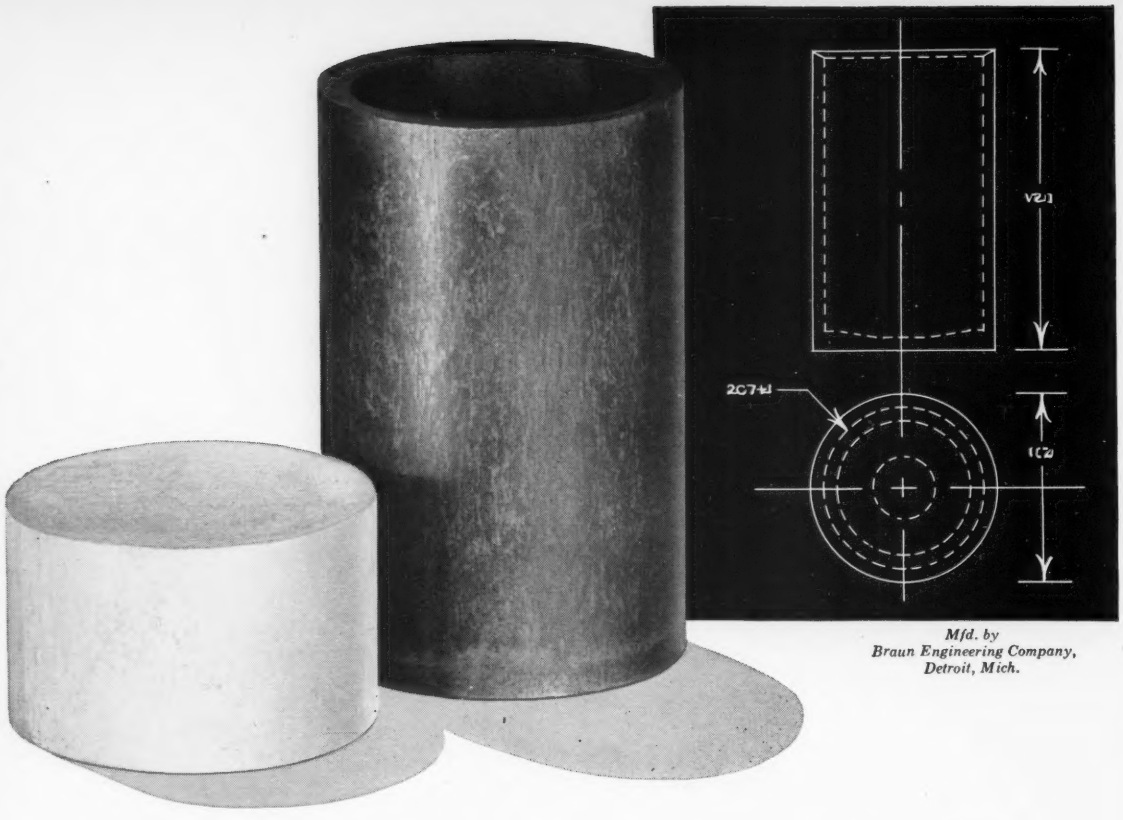
SM-1-8





Mfd. by
Braun Engineering Company,
Detroit, Mich.

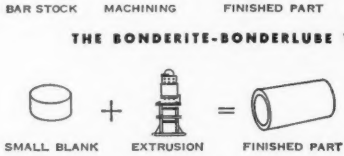
EXTRUDED...*and sold for less than the raw stock used to cost!*

Cold extrusion of steel means big reductions in material, machinery, and time. Frequently, as in the case of the automotive motor mount above, the part is made by cold extrusion for about the cost of the raw metal used in conventional methods.

More and more, manufacturers are turning to cold extrusion as a cost cutting, simplified method of making quality parts. Machining is cut to a bare minimum and scrap virtually disappears. "Impossible" jobs are being mass produced at high rates and a lot of the "impossibles" have become production runs only because of Bonderite and Bonderlube.

These two remarkable aids in cold extrusion make metal flow like magic. More severe deformations are possible. Tool and die life are multiplied. Rejected parts are few and far between. Production speeds are greatly increased. Smooth finishes are easily achieved and maintained.

The Parker cold forming staff can give you expert help in the technique of cold extrusion.



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BONDERITE and BONDERLUBE aids in cold forming of metals

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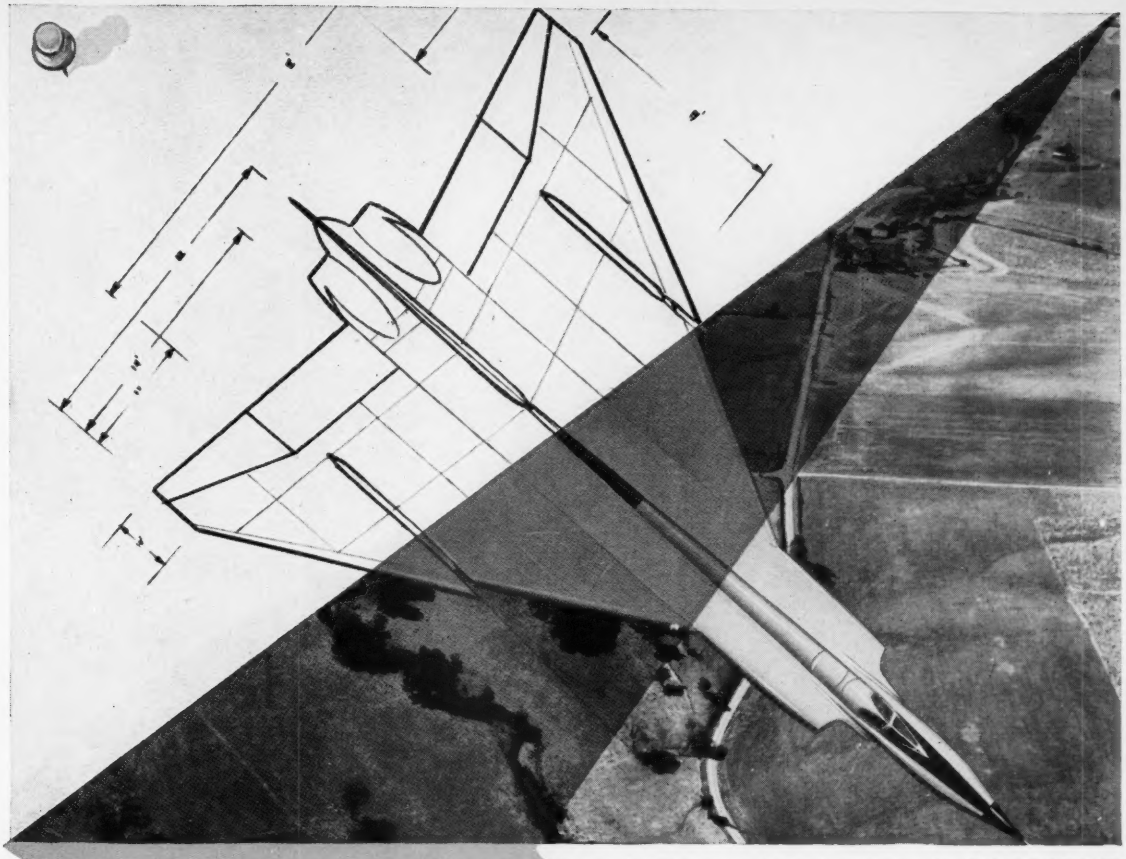
TROPICAL heavy duty maintenance paints since 1883

**Bonderite, Bonderlube, Parco, Parco Lubrite—Reg. U.S. Pat. Off.*



The complex electrical generating system of the new Avro Arrow was designed and developed at LUCAS-ROTAX.

ADDING THAT VITAL DIMENSION

with Lucas-Rotax creative engineering

From your concept to a functional reality . . . this transition calls for expert help!

Lucas-Rotax engineers can supply that help, drawing upon their company background of designing equipment into the finest engines and aircraft for the past twenty-five years.

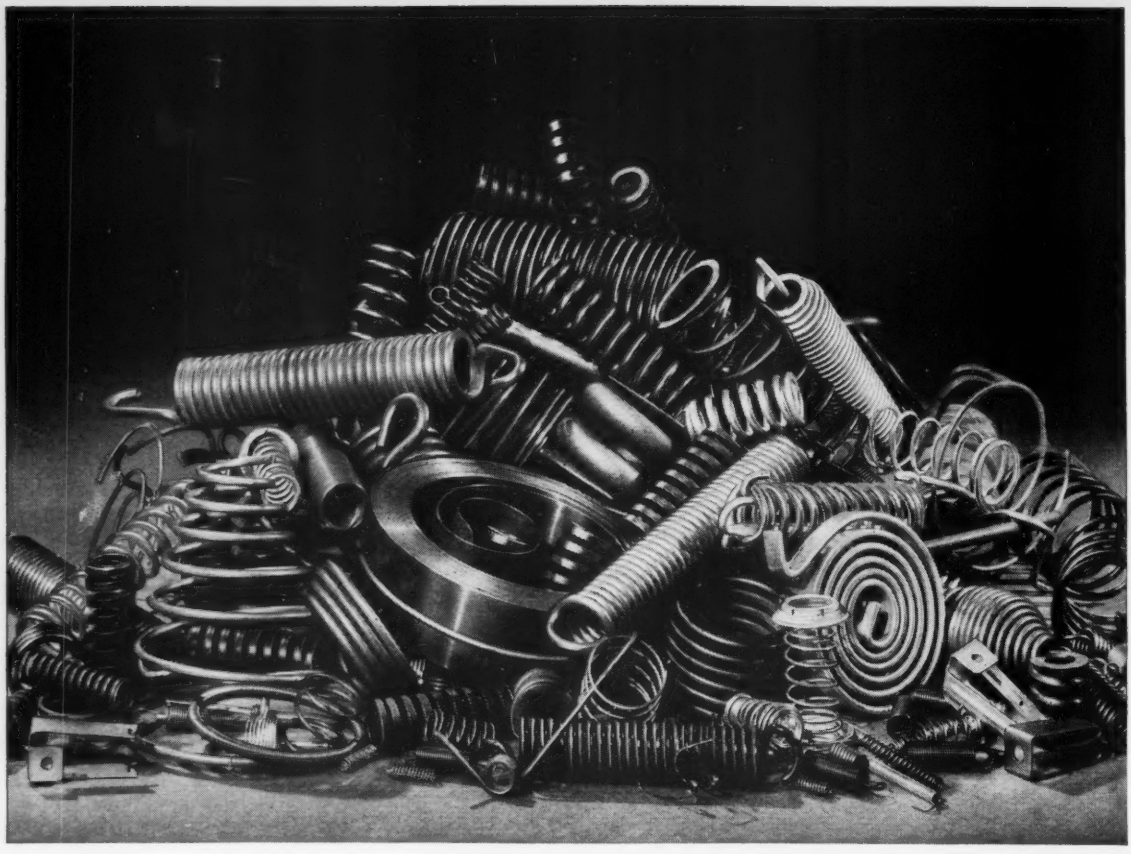
In Canada, Lucas-Rotax alone has the breadth of experience and the manufacturing facilities to implement *your* engineering vision. Write or call us for further information. 5804-R

LUCAS-ROTAX

LUCAS
ROTAX

Fuel, electrical and hydraulic systems for the aircraft and avionic industries.

TORONTO—2200 Eglinton Ave. East, PL. 5-4171 **MONTREAL**—5595 Royal Mount Ave., RI. 8-7737 **VANCOUVER**—International Airport, CR. 8-5104



needle in a haystack?

Finding just the right spring can be costly and time-consuming. Even though springs look alike, each is different—depending on the job it has to do. Type, size, tension, temper, stress, and other complicating factors must be considered in their design and manufacture.

If finding the right spring for *your* problem seems like "looking for a needle in a haystack," Wallace Barnes can help you. Our spring engineers are ready to accept your precision mechanical spring problem and help design the *right* spring to do your job *precisely* right.

Send for your free copy of
Spring Design and Selection—in Brief
our authoritative digest on spring engineering

Selecting the right spring is simple . . .

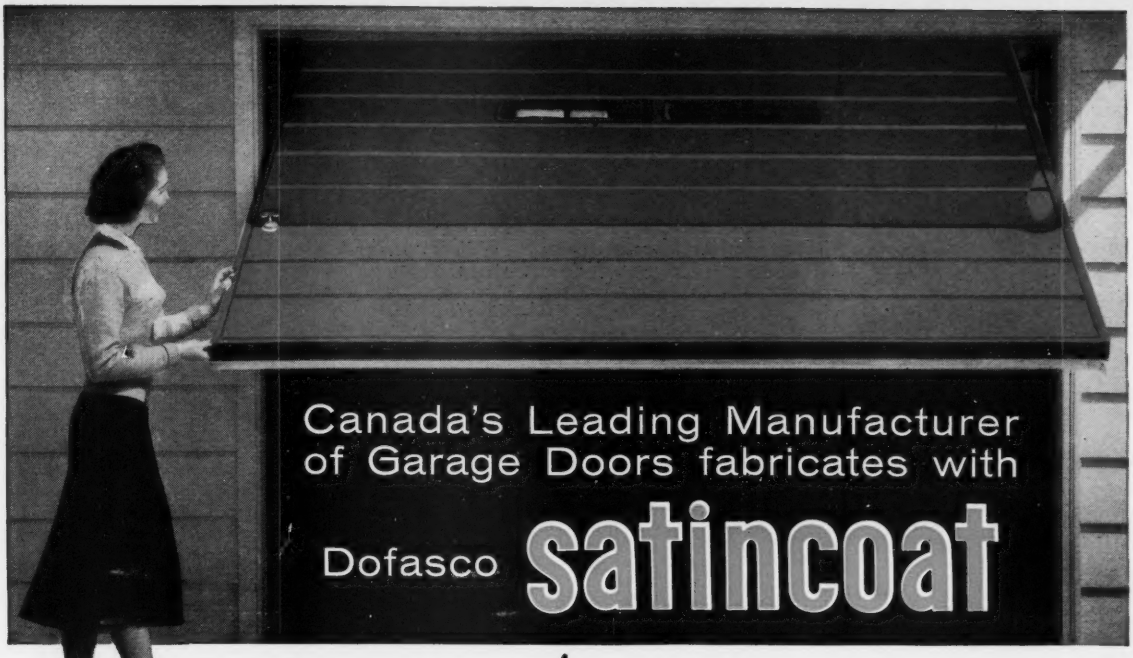
JUST CALL THE

MAN FROM

Wallace Barnes

Company Limited • Hamilton, Ontario

64-205



Here's why—

BUY CANADIAN — KEEP CANADIANS EMPLOYED

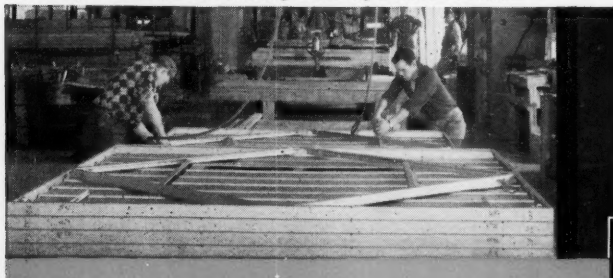
"We chose Satincoat for ease of fabrication and a highly saleable product."

"We're in a competitive field where costs and quality really count — and Satincoat has contributed to our success," says this manufacturer. "Satincoat is easy to work and helps us keep fabricating costs in line. We like its paintability, too. We can give it a good, smooth finish without surface preparation. That zinc coating on Satincoat gives our doors extended life. It keeps them looking better, longer. The doors don't rust when the paint gets scratched!

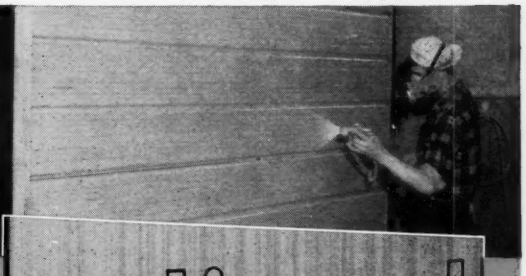
"People like our products — Satincoat is certainly one of the reasons!"

- Satincoat resists rust, protects your product during manufacture — and long after.
- Satincoat's rust-resisting zinc coating will not crack or peel during or after fabrication.
- Satincoat takes paint, lacquers or enamels without surface preparation. Naturally, any oils or greases picked up during processing must be removed before paint is applied. This is ordinary painting procedure regardless of the material used.
- Satincoat is available in a complete range of sizes and gauges, and in sheet or coil form.

The production line runs smoothly with easily fabricated Satincoat.



Satincoat needs no surface preparation — is easily painted.



this seal on your product means QUALITY

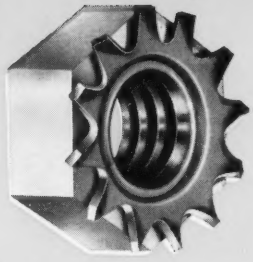
A QUALITY PRODUCT MADE WITH Dofasco satincoat A ZINC COATED STEEL FOR LASTING STRENGTH AND BEAUTY

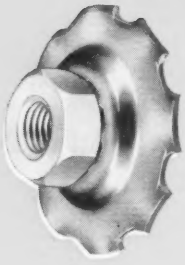
satincoat

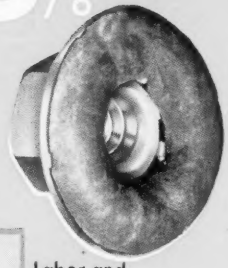
DOMINION FOUNDRIES AND STEEL, LIMITED, HAMILTON, CANADA

23-5306

KEPS® ... ONE UNIT REPLACES TWO OR MORE ... CUTS COST 26%







Keps—mechanically pre-assembled Shakeproof® Lock Washers and nuts—eliminate handling two or more separate parts on the assembly line. Case studies in hundreds of applications prove that Keps save time and substantially reduce costs.

For example, the total cost of ordinary nuts and separate washers averages $15.67 per thousand (chart above at left). Compare that with Keps (above right)—labor and burden are cut in half because Keps do not require hand assembly of nut and washer—total cost is down to $11.56 per thousand. On the average, Keps save 26% of total fastening cost! Your best opportunity for real savings is not in lower fastener prices but in labor saving fasteners like Keps. A complete discussion of this important concept is contained in the Shakeproof "Price-Per-Thousand" booklet. Be sure to write for your copy today.

Keps are available in a wide range of sizes in Standard Machine Screw and Finished Hexagon Series. Other types that offer even greater cost-saving opportunities are Dished Washer Keps, Domed Washer Keps, Sealing Keps and special-dimension Keps. Try them now!

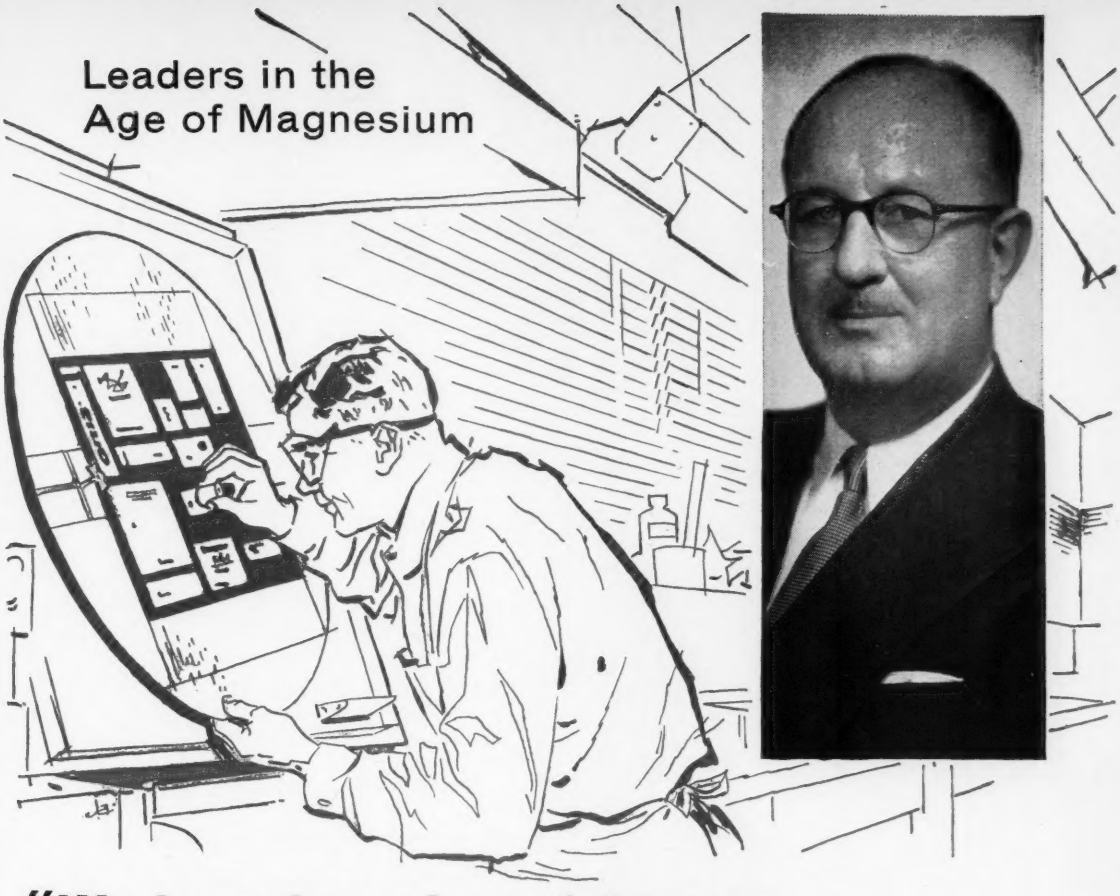
SHAKEPROOF/FASTEX

DIVISION OF CANADA ILLINOIS TOOLS LTD.

67 SCARSDALE ROAD · DON MILLS, ONTARIO

Send for free sample kit

Test Keps yourself. See how you can save assembly costs immediately with only one part to handle instead of two or more!



"We have based our future on
MAGNESIUM

"We at Brooks and Perkins based our future on Magnesium a good many years ago. We have prospered. We have found that Magnesium will do a job in economic competition with other materials in a hundred different ways. Not only have our fabricating plants in Detroit been expanded, but we were able to install our own rolling mills in nearby Livonia. Metal dealers warehouse our products, and we have offices in New York, Washington, Los Angeles and Dallas.

"Domal High Purity Magnesium is contributing to the success of Brooks & Perkins' Magnesium Printing Plates. Our Magplate Division tells us that its high quality and uniformity gives almost as much advantage over our earlier plates as magnesium has over other metals.

Extract from a letter by Mr. Howard Perkins, President, Brooks and Perkins Inc., Detroit, Michigan.

DOMAL
HIGH-PURITY
MAGNESIUM

THE WORLD'S LIGHTEST, MOST VERSATILE METAL

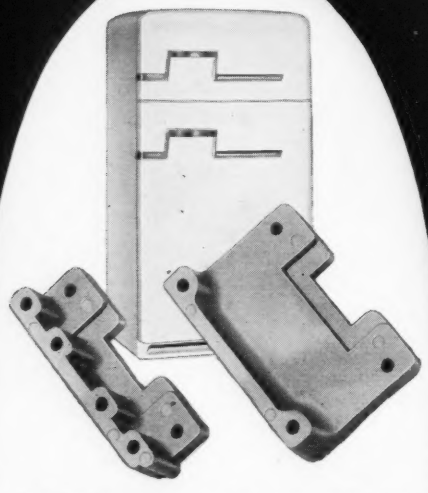
DOMINION MAGNESIUM LIMITED

320 BAY STREET · TORONTO, CANADA

The original engravings for this advertisement were made on magnesium

LOWER MANUFACTURING COSTS

...with molded reinforced polyester



SIMPLER ASSEMBLY

FOR ✓ Servel

Bracket and support for refrigerator liner and evaporator, molded of ATLAC Thermaflow compound, replace (1) multiple-piece assembly of steel part, spacer and fasteners and (2) machined piece of laminate. Gave superior thermal insulation, better shock resistance, simplified manufacture. Molded for Servel, Inc. by Kurz-Kasch, Inc., Dayton, Ohio.

Assembly time is cut to the bone and machining is eliminated when you design with ATLAC Thermaflow molding compounds in mind. Complex multi-piece assemblies can often be molded in one rigid piece, complete with molded-in bushings and fittings. Machining is made unnecessary by precision molding techniques and excellent surface finish. Surfaces need no painting—the part is corrosion resistant and available in colors.

In addition, ATLAC Thermaflow materials offer;

- **Weight savings: specific gravity 1.8**
- **High impact and flexural strength**
- **Superior corrosion resistance**
- **Excellent electrical insulation and arc tracking resistance**

To the molder—

ATLAC Thermaflow materials are easy to mold in large shapes, with deep draw and intricate detail. Reinforcement flows evenly throughout the piece . . . no weak spots at corners or edges. Compression or transfer mold them on standard presses, at temperatures from 275-350°F., and pressures from 500 psi and up. Curing time is relatively short.

A wide range of glass fiber and nylon rag reinforced grades is available. Write today for literature on materials, molding recommendations and applications.

Atlac THERMAFLOW—Trademark, Atlas Powder Company

ATLAC THERMAFLOW

ATLAS

ATLAS POWDER COMPANY
CANADA, LTD.
Brantford, Canada
Offices in **MONTREAL, TORONTO, EDMONTON, VANCOUVER**

IN CSI ALUMINUM CASTINGS

The spectrum confirms the chemistry . . . the quality proves itself

Spectographic analysis assists the metallurgist in maintaining careful control of the chemical composition and confirms the results in the finished casting. All conventional inspection methods are in use as well as these tests — X-Ray, dye-penetrant, and pressure methods, gravimetric, photometric and volumetric analyses. They permit close quality control at various stages of production . . . and help ensure the soundness of the finished casting.

But quality control must be supplemented by the other essentials of good foundry practice. Here C.S.I. expert craftsmen, employing age-old foundry skills, using modern, up-to-date equipment, produce sand, permanent mould and pressure die castings . . . strong and sound. That's how C.S.I. Aluminum castings prove themselves.

CSI castings have proved themselves in all these industries:

- Heating and air conditioning equipment
- Domestic appliances
- Lighting equipment
- Kitchen equipment
- Instrumentation, meters, gauges, controls, etc.
- Electrical distribution apparatus
- Brewery equipment
- Elevators and mine hoist equipment
- Mine car parts
- Food shopping equipment
- Builders' hardware
- Electric motors
- Engine components
- Marine hardware
- Oil line and refinery equipment
- Irrigation equipment
- Textile machinery
- Toys

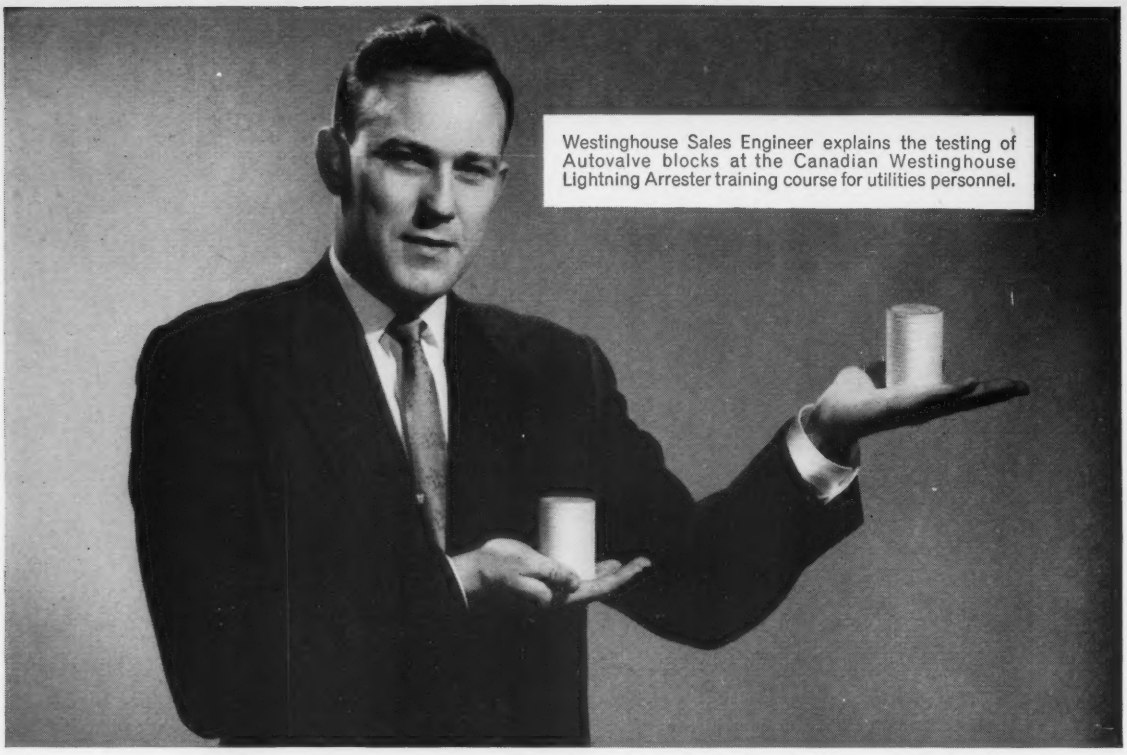
CSI

CANADIAN STEEL IMPROVEMENT LIMITED

289 Horner Avenue, Toronto, Ont.

***Represented in the United States ONLY by*—C. F. RUSSELL COMPANY INC., Bay Shore, New York**

Forgings in Steel, Aluminum, High Temperature Alloys, Titanium, Castings in Aluminum



Westinghouse Sales Engineer explains the testing of Autovalve blocks at the Canadian Westinghouse Lightning Arrester training course for utilities personnel.

These cakes turn out "perfect every time!"

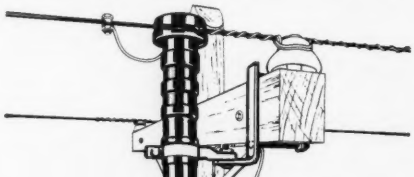
LIKE the cakes grandma used to make, these Autovalve arrester blocks are made by careful mixing and baking. But their Westinghouse recipe calls for precision which would astound the most painstaking chef!

Every batch of the silicon carbide "flour" they're made with must be double-checked for quality before a single grain is accepted. It's sifted, re-sifted and mixed to exact proportions in three grain sizes. Then after baking, the blocks must stand up to punishment far more severe than they will ever encounter in service. Every block receives: (1) *Two surges of 10,000 amp 12 x 45 microsecond long tail waves while energized at 6,000 volts.* (2) *A 1,500 amp surge current test with protective qualities checked on a cathode ray oscillograph.* In addition, a five percent sample receives *50 discharges of 10,000 amp 12 x 45 microsecond long tail waves.*

Tests like these are typical of the quality controls that safeguard every step in the making of Westinghouse Lightning Arresters. They're better because they're *made* better. They'll give *your* distribution apparatus the most dependable protection there is—at lowest possible cost.

Get complete data *now* on industry's most *complete* line of arresters . . . both valve and expulsion types (each pioneered by Westinghouse).

For details about the Westinghouse Lightning Arrester Training Course for Utilities, call your Westinghouse sales office. Or write Canadian Westinghouse Company Limited, London, Canada.



Type LV Autovalve Arresters give you these Westinghouse advanced design features: pre-ionized gap assemblies, moisture-proof seals, line lockout prevention drop-outs.

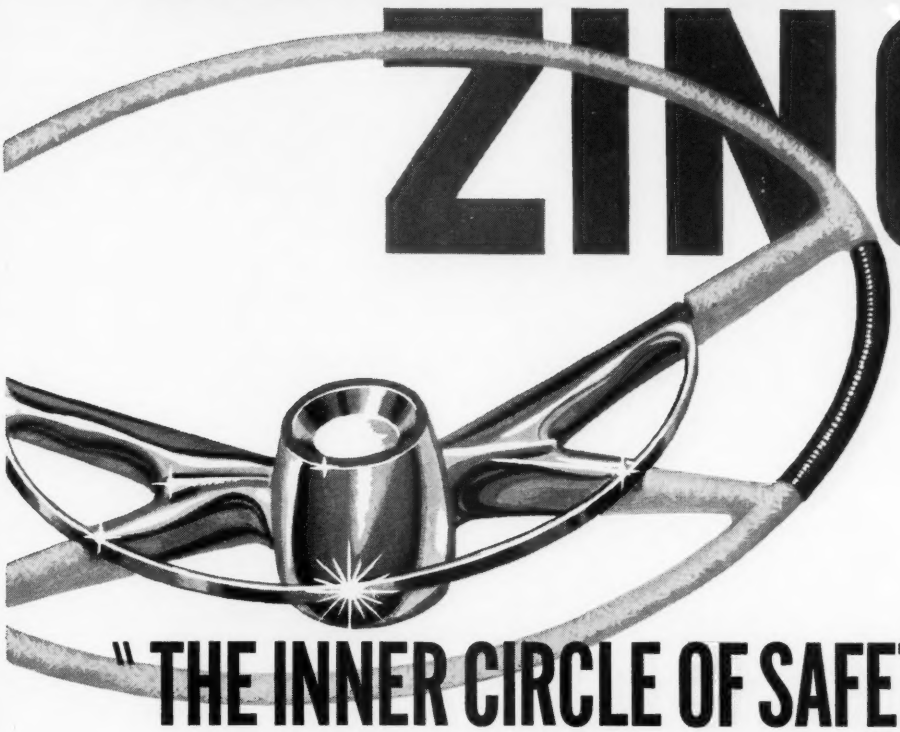
Canadian Westinghouse serves Canada's utilities with a complete line of advanced distribution equipment

YOU CAN BE SURE... IF IT'S Westinghouse

58-D520

Enjoy the New Dramatic Series, Westinghouse "Studio One in Hollywood" on Monday Nights TV

die cast from TADANAC ZINC



"THE INNER CIRCLE OF SAFETY"

An automobile horn may startle and annoy you . . . or it may save your life!

Following the curve of the steering wheel just inches away from the driver's hand, the horn ring on a modern automobile stands ready to sound a warning to pedestrians and other vehicles. It's strong, attractive and durable—die cast in Zinc!

For flexibility of design, combined with the economy of accurate, low temperature, high speed operation, die casters choose alloys of Zinc. And, for consistent high quality, assured supply and prompt delivery, Tadanac Zinc is the preferred brand for die casting alloys!

If you require information or assistance regarding your Zinc die casting operations, contact our Technical Service Staff. Your inquiries will receive prompt attention.

THE CONSOLIDATED MINING AND SMELTING COMPANY OF CANADA LIMITED

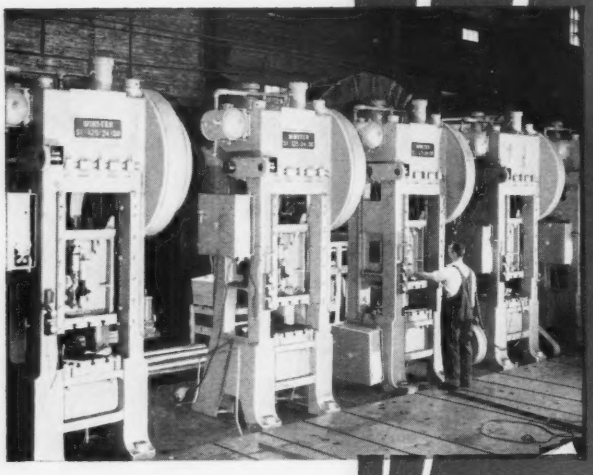
COMINCO

METAL SALES DIVISION: 215 ST. JAMES STREET W., MONTREAL 1, QUEBEC, CANADA
Sold in United States by: AMERICAN METAL CLIMAX, INC., 61 BROADWAY, NEW YORK 6, N.Y., 1 N. LASALLE STREET, CHICAGO, ILL. • THE AMERICAN METAL COMPANY, LIMITED, OF MICHIGAN, 4172 PENOBSCOT BUILDING, DETROIT, MICHIGAN • THE AMERICAN METAL COMPANY, LIMITED, OF CALIFORNIA, NATIONAL OIL BUILDING, SIXTH STREET AND GRAND AVENUE, LOS ANGELES 17, CALIFORNIA

TADANAC ZINC SHAPES THE THINGS TO COME

8109

- for metals processing
- for the mining industry
- for pulp and paper mills
- for the steel industry



Five 125-ton Minster Presses for an Ontario steel processing company are re-checked before shipment from Canada Iron's shops.

HAVE YOU CONSIDERED

the machinery building ability of

CANADA IRON?

In Trois Rivières and in Toronto, Canada Iron operates plants for building machinery from a single, small unit to a battery of presses (as illustrated). Year in, year out, these plants are producing machinery for every type of industry from the Atlantic to the Pacific.

An experienced Engineering Staff is at your service. Make a point to bring your problems, or your blueprints, to Canada Iron.

Canada Iron
MACHINERY
CANADA IRON FOUNDRIES, LIMITED

Sales Offices Montreal: 921 Sun Life Building, UNiversity 6-7841 • Toronto: 169 Eastern Avenue, EMpire 3-8801

Another
HYGRADE
"First in Canada"...

THE ONLY COMPLETELY CORRUGATED "STOVE PACK"

...offers maximum protection during shipment

Having successfully completed a series of rigorous tests involving vibration, corner impact and face impact, HYGRADE's sturdy all corrugated stove pack is now being used by a leading stove manufacturer. It provides yet another striking example of the consistently high quality, wide range and versatility of Corrugated Containers *custom-made* by HYGRADE with *100% Kraft liner.*

HYGRADE's unique design uses the tube and cap principle to cut packing and unpacking time. It also reduces inventory problems because most of the interior parts are interchangeable between the 30" and 24" range.

Remember—the container you ship your product in *can* make a difference to your profit picture. For expert help in solving *your* packaging problems quickly and efficiently, call on HYGRADE's Technical Service Division. Check with the sales office nearest you.

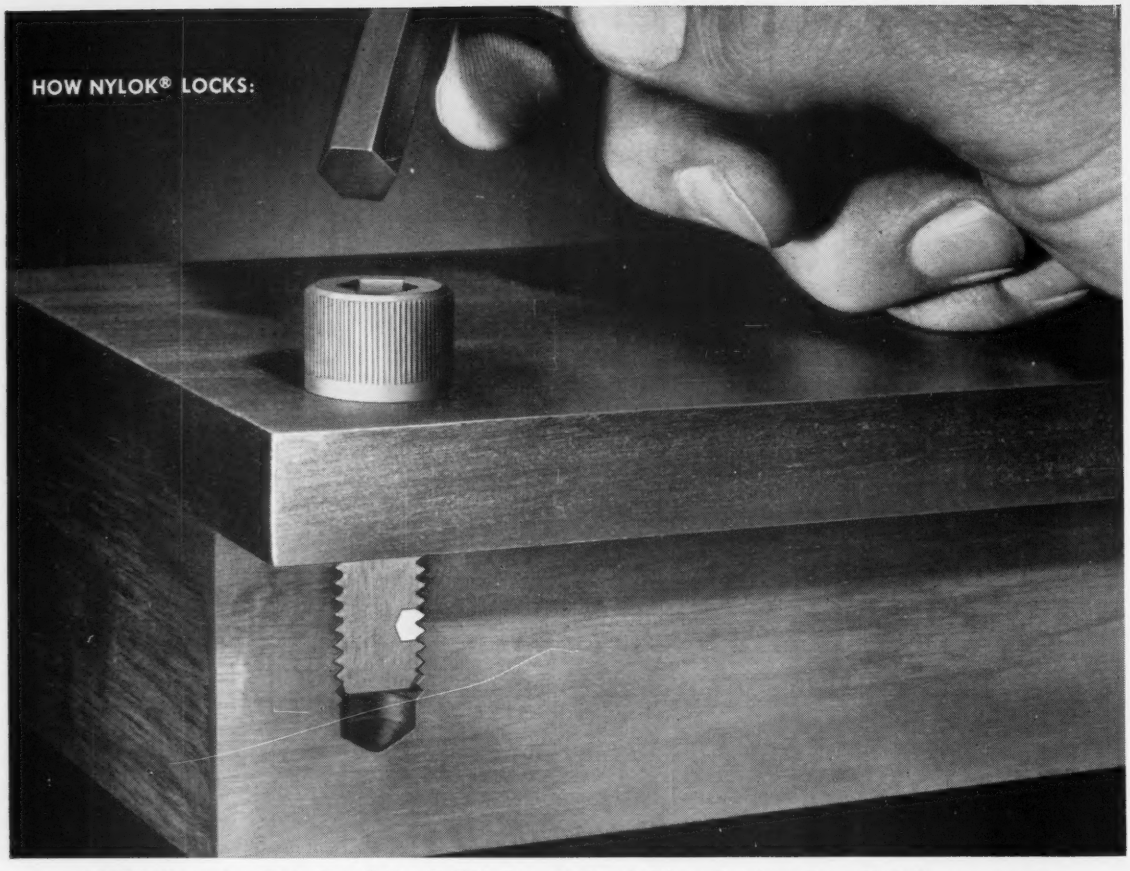
For containers designed to go places, call

HYGRADE CONTAINERS LIMITED

Plants: London Toronto Montreal

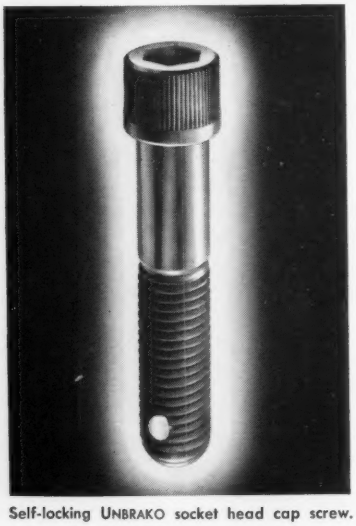
Sales and Service Offices: Toronto Kitchener Ottawa Hamilton Windsor Sherbrooke London Montreal Quebec City

A Subsidiary of **CANADIAN INTERNATIONAL PAPER COMPANY**



LOCKED! The tough, resilient nylon pellet keys itself into the mating threads. It forces threads together and locks the screw securely.

NEW—self-locking UNBRAKO socket head cap screws



Self-locking UNBRAKO socket head cap screw.

They won't work loose. And they simplify design and save production time.

UNBRAKO socket head cap screws are now available embodying the Nylok* self-locking principle. Nylok provides the first truly practical solution to the problem of making cap screws self-locking.

An UNBRAKO cap screw with Nylok is a single self-locking unit. No auxiliary locking devices are needed. Just thread the UNBRAKO into any tapped hole. *Seated or not*, it locks positively wherever wrenching stops. The tough, resilient nylon pellet forces mating threads together and holds tight. The screw will not work loose.

You save production time when you make products with self-locking UNBRAKOS. And you get greater simplicity in design with less bulk and weight. The number of parts you must assemble to achieve full locking action is reduced to the absolute minimum. Lockwashers under screw heads are no longer necessary. Costly wiring of cross drilled heads is eliminated. And in many cases you will save weight and mass by using shorter screws in tapped holes instead of drilling through and using nuts and lockwashers.

Self-locking UNBRAKOS are reusable. They have uniform locking and installation torques—with no galling or seizing on mating threads. They successfully withstand temperatures from —70° to 250°F. And, when screws are properly seated, the locking pellet also functions as a liquid seal.

A complete line of self-locking UNBRAKO socket screw products, in a wide range of standard sizes, materials and finishes, is available through your authorized industrial distributor. Technical data and specifications are detailed in Bulletin 2193. Write us for your copy today.

**T.M. Reg. U.S. Pat. Off., The Nylok Corporation*

STANDCO CANADA, LTD.
193 Bartley Drive
Toronto 16, Ontario

SERVO COMPONENTS
TO COMPLETE ASSEMBLIES

DAYSTROM TRANSICOIL designs and manufactures a wide variety of precision servo components and complete assemblies for both industry and the military. The precision that goes into these products is the result of many years of specialized experience in the servo field. You're getting a head-start on quality when you specify Daystrom Transicoil . . .

SERVO MOTORS & MOTOR GENERATORS

Frame Size: 6, 8, 9, 11, 15, and 18 for 60 and 400* cycle operation
Standard Operation: −55 C to +120 C
*400 cycle units may be wound for operation with transistor drive

GEAR TRAINS

Mounted on the motor or generator
Maximum backlash will not exceed 30 minutes as measured with a 1 in.-oz load on the output shaft.
Ratios from 7:1 to 2187:1. Other ratios available to suit customer specifications

SYNCHROS—Transmitters, Control Transformers, Differentials

Frame Sizes: 8 and 11 for 400 cycle operation
Also Inductive Potentiometer, Frame Size 11, 400 cycle, infinite resolution
Output: linear

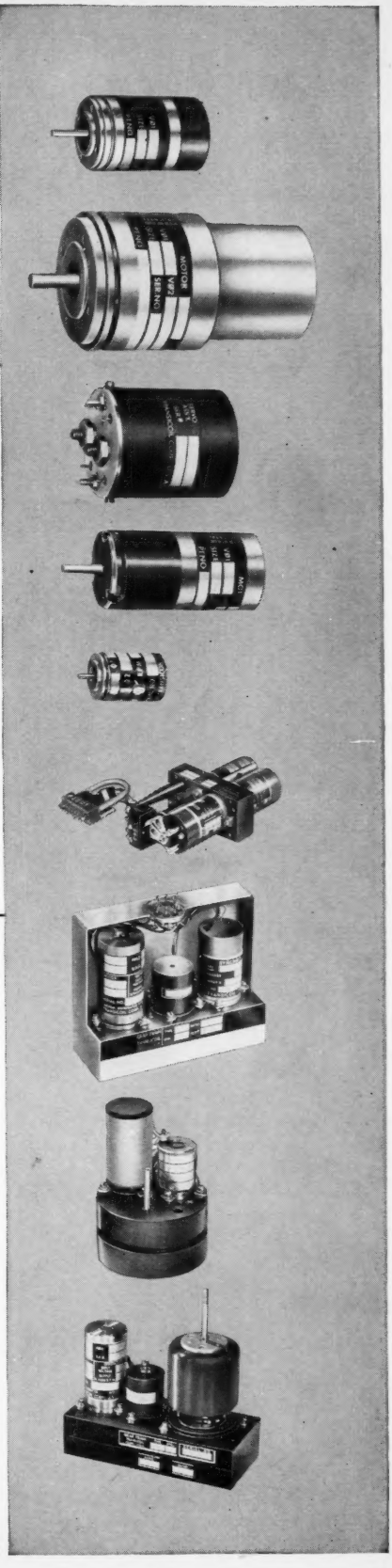
AMPLIFIERS—Tube or Transistor Types

Miniaturized amplifiers to drive a combination of Daystrom Transicoil rotating components and assemblies
Designed to meet industrial and military requirements

COMPLETE ASSEMBLIES

Design and manufacture of complete servo assemblies to customer specifications

CATALOGUE — *For complete specifications, mechanical data, dimensions, and characteristics, write for the Daystrom Transicoil Catalogue.*



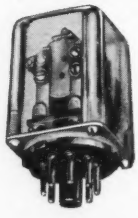
DAYSTROM LIMITED

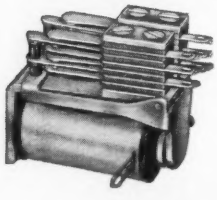
840 Caledonia Road, Toronto 19, Ontario;
5430 Ferrier Street, Montreal 9, Quebec.
A subsidiary of Daystrom Incorporated.

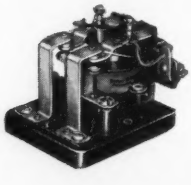
5828

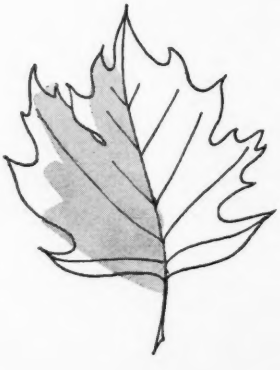
NOW MADE IN CANADA

RELAYS BY POTTER & BRUMFIELD





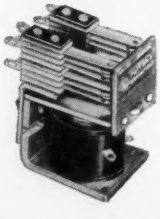




P&B relays are now being made on a limited scale at Guelph, Ontario. In time, we plan to manufacture our complete line in Canada, for Canadian use.

Meanwhile, a full stock of standard relays, more than 480 variations of 57 basic types, will be maintained at Guelph. These standard relays are available "off the shelf" at franchised P&B distributors throughout Canada.

Whatever your relay requirements may be, your inquiries will be welcome. Send today for our latest catalog... or contact the P&B Canadian Sales Representative nearest you.



SALES REPRESENTATIVES

Aeromotive Engineering Products
5257 Queen Mary Road
Montreal, Quebec
Telephone: Elwood 9602

A.T.R. Armstrong, Limited
P.O. Box 38, Station D,
Toronto 9, Ontario
Telephone: Roger 2-7535

Charles L. Thompson, Limited
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North Vancouver, B.C.
Telephone: Yukon 8-2597
also
87 King Street
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POTTER & BRUMFIELD CANADA LTD.
GUELPH, ONTARIO

You can bet your life on vibramix!

says Martin Scholler, Pres., International Divers Corp.

"I have! I personally test all the underwater equipment we manufacture. This vital air demand regulator, of molded VIBRAMIX, *has proved itself stronger and much safer. And, because a* VIBRAMIX *molding eliminates more than 25 finishing operations, I can make and market this greatly improved air regulator for $10 less . . . A saving to the customer of nearly 17%."*

Mr. Scholler has also achieved big savings in many other ways — by molding with VIBRAMIX instead of casting with expensive non-corrosive metals.

Amazing VIBRAMIX is a polyester molding compound with reinforcing filler such as glass fibre or asbestos, in any colour you wish. It readily obeys medium pressures and heats, by either compression or transfer molding.

You may find it very profitable to learn all about VIBRAMIX. For complete information or technical assistance, write or call Naugatuck Chemicals at Elmira, Ontario, or our branches in Montreal, Toronto, Winnipeg or Vancouver.

OTHER SPECIAL FEATURES: **Good heat stability • good dimensional stability • excellent electrical properties • no glass preforming, resin mixing, preheating or post-curing • short molding cycles • uses standard compression and transfer molding machines and techniques.**

Other NAUGATUCK Plastics

Vibrin — Polyester Resins
Marvinol — Vinyl Resins
Kralastic — Styrene Copolymers

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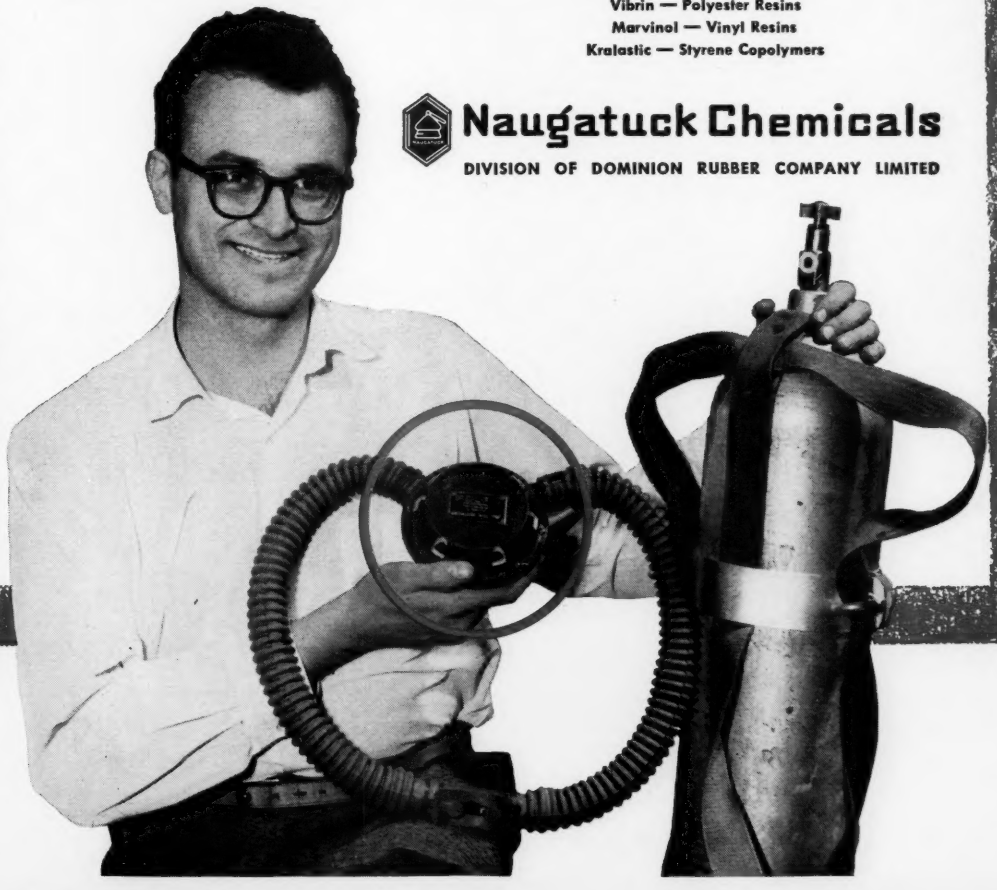

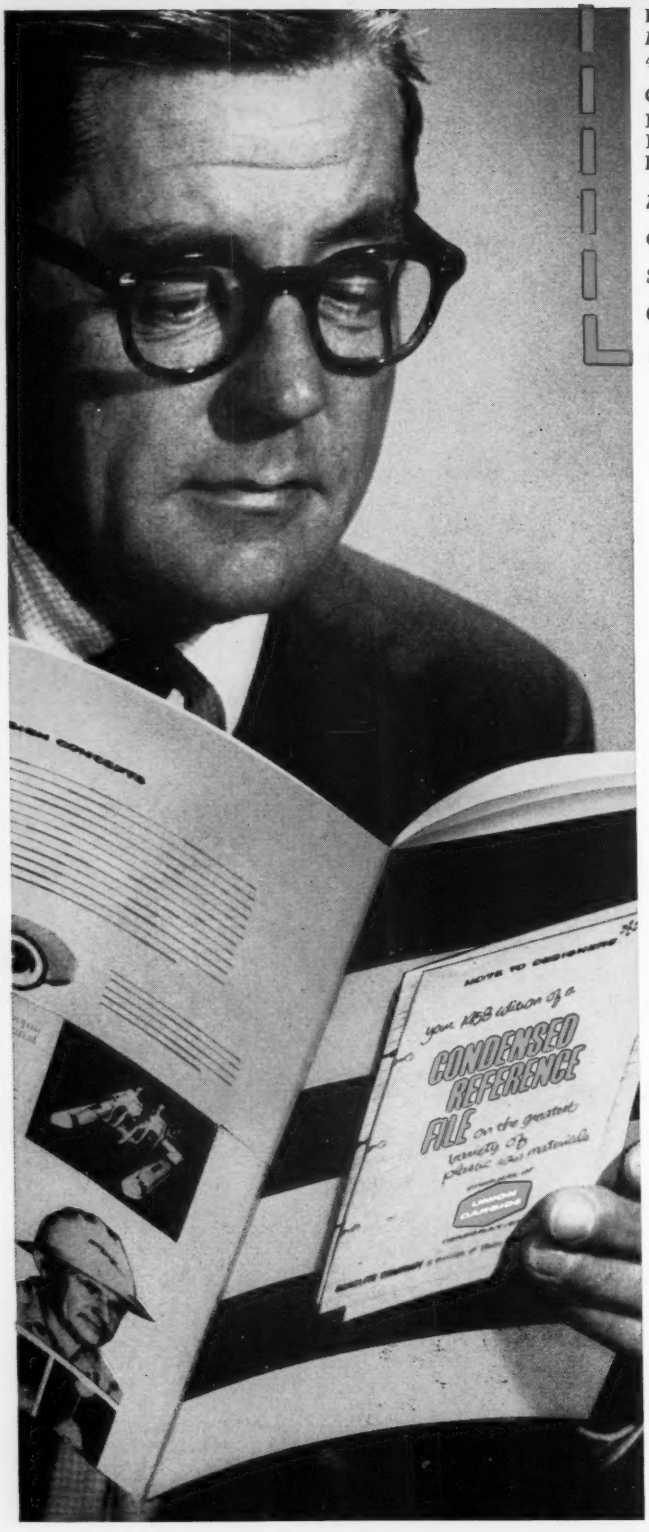

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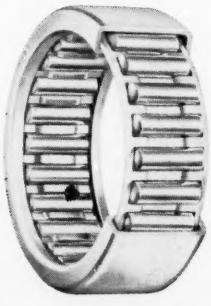

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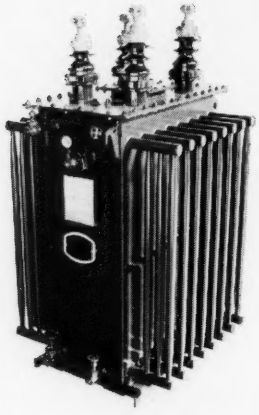

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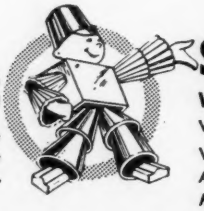

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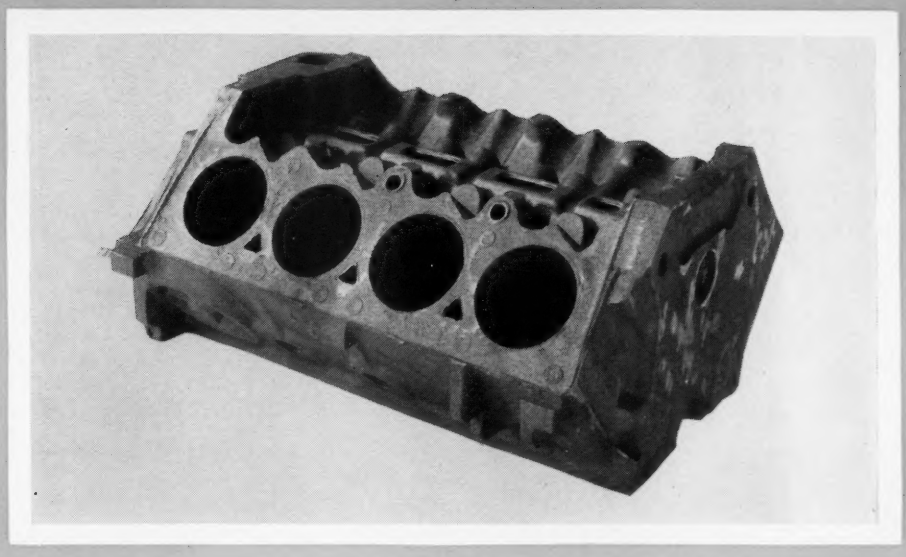


Light alloy casting

What are the factors dictating the type of casting used?

Castings of aluminum and magnesium alloys can be obtained in the form of sand castings, permanent-mold castings and pressure-die castings.

The type of casting that is best for a particular application depends on several factors, among which are: the number to be made, the shape and size, the finish required, the dimensional accuracy and the mechanical properties.

Some comparisons are made in Table 1.1.

Magnesium alloy nomenclature

In Canada and the U. S., the ASTM system of nomenclature and temper designation has been officially adopted by the Magnesium Association.

Designations for the magnesium alloys thus consist of not more than two letters representing the alloying elements specified in the greatest amount (arranged in order of decreasing percentages or in alphabetical order, if the percentages are equal) followed by the respective percentages rounded off to whole numbers. The full name of the base metal precedes the designation, but this is omitted when it is obvious which one is meant. Some of the letters used are:

A—aluminum; E—rare earths; H—thorium; K—zirconium; Z—zinc.

Thus, alloy AZ 81 contains nominally 8.0% aluminum and 1% zinc, whilst ZK51 has 5% zinc and 1% zirconium.

Magnesium-zirconium alloys

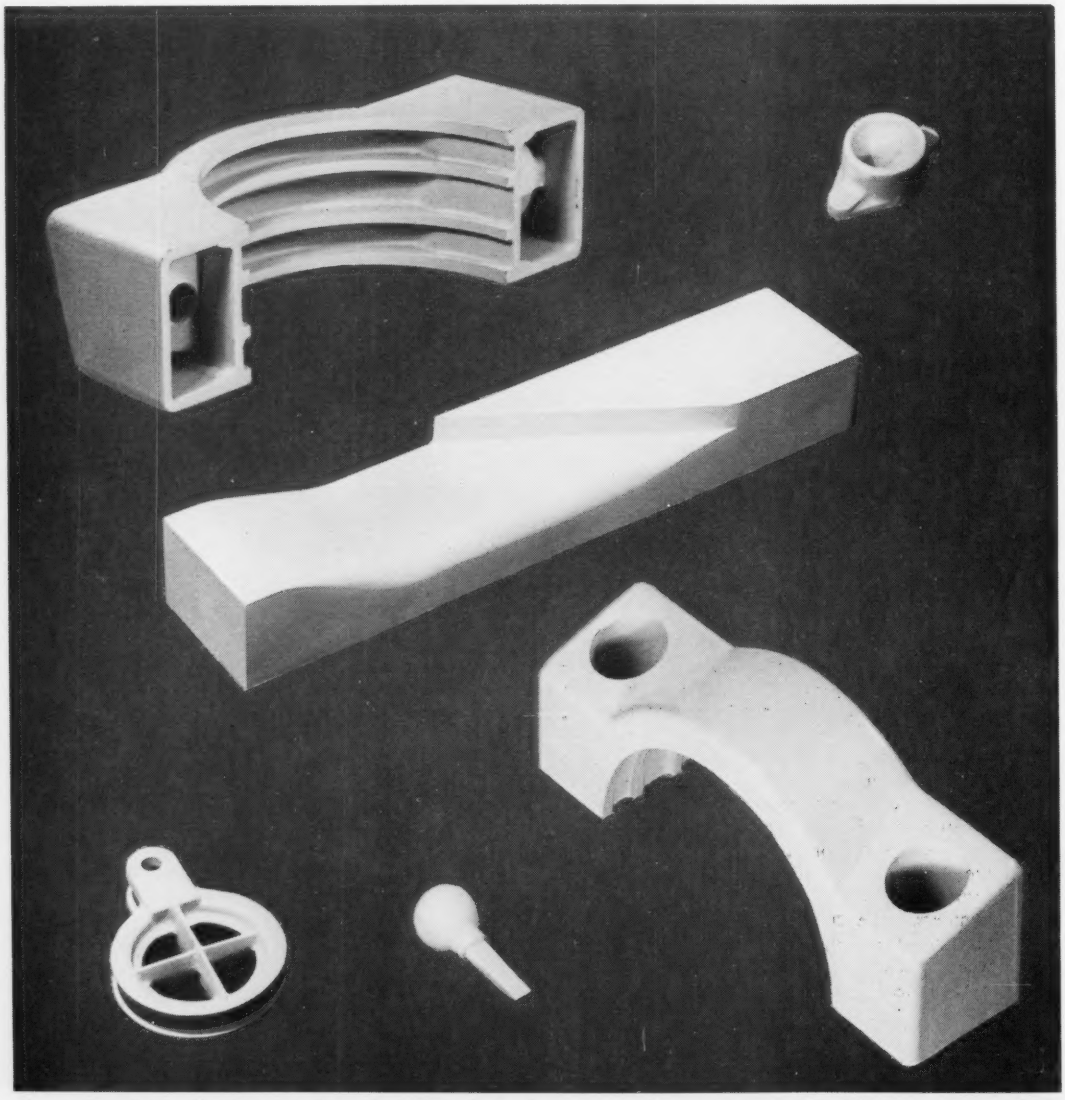
The history of these alloys can be traced to the middle thirties when metallurgists at Magnesium Elektron Ltd. in the U. K. discovered that zirconium has a grain refining effect on magnesium, as a result of which the mechanical properties are improved.

The first two magnesium base alloys were ZK51 and EZ33. Of these, ZK51 contains 0.7% zirconium and 4.5% zinc while EZ33 is made up of 0.7% zirconium, 2.5% zinc and 3% rare earth. Further developments produced the ZH62 and HZ32 alloys. ZH62 has 0.7% zirconium, 1.7% thorium and 5.5% zinc, while HZ32 contains 0.7% zirconium, 3% thorium and 2.3% zinc.

ZRE1 alloy is the first successful creep-resistant or high temperature magnesium base alloy. Creep is, of course, defined as the flow (or plastic deformation) of metals held for long periods at stresses lower than the normal yield strength of the metal.

Table 1-1—Comparison of casting methods

Sand casting	Die casting and permanent-mold casting
Because there is a limit to the size of a metal mold, large (or intricate) cored parts are usually cast in sand molds.	Metal dies for permanent-mold and die casting cost more than the pattern equipment for sand casting. The minimum number of castings necessary to make it worth while having a metal mold (or die) varies greatly with the nature of the casting. Smoother surfaces and closer dimensional tolerances result from metal molds, die castings generally being superior to permanent-mold castings. The rapid rate of solidification of a permanent-mold casting usually results in higher mechanical properties than from the same alloy cast in sand. This is also the case with die casting, although it may be offset by other factors, such as machine pressures, tool design or venting.



Composite picture showing a variety of parts made in aluminum and magnesium by the different casting methods.

Sand casting

This is the most versatile of all the casting processes

Sand casting is the most versatile of the casting processes. It is suitable when only a few parts have to be made, when the parts need intricate coring or when they are big. Large castings cannot, in fact, be produced economically by any other method.

There are three sand molding methods: green sand mold, dry sand mold and CO_2 low pressure curing.

Sand molds squeezed under pneumatic pressure on patterns are termed squeezer molds. They are rarely used for castings over 30 in. Larger molds are made by ramming and jolting the sand to the necessary hardness in molding boxes.

Green sand molds are not cured and call for less production time than do dry sand molds. Thus, green sand castings usually cost less.

Dry sand molds are cured in ovens to remove all moisture. Curing hardens the cores and mold sections so that they are readily handled in assembly.

The hardening of cores and molding sands by the carbon dioxide process (developed over the past two years) is now established practice in a large number of Canadian foundries.

CO_2 gas is passed through a core having a sodium silicate binder, as a result of which the two combine to form a colloidal silica gel around each sand grain, cementing them together within a few seconds.

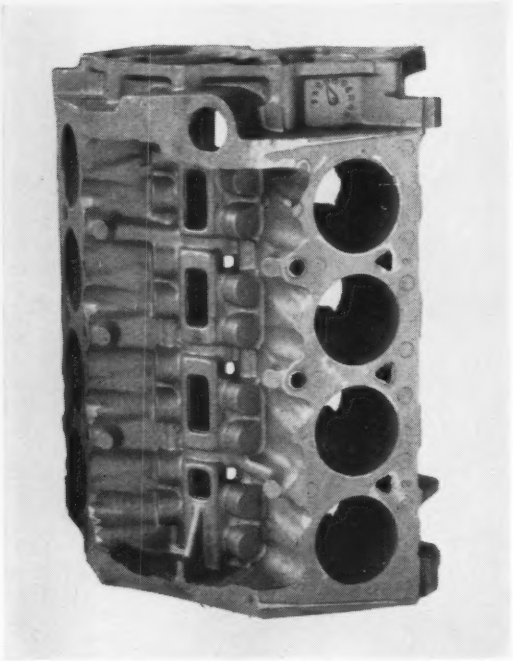
By using the CO_2 method, cores are hardened in a matter of seconds without oven baking. This eliminates extra handling, floor space and investment in baking ovens.

Details of aluminum and magnesium sand casting alloys are given in Tables 2.1, 2.2 and 2.3.

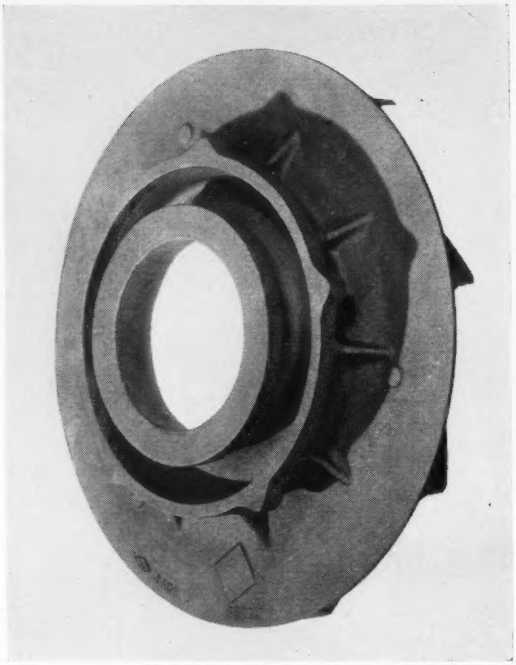
Light alloy sand castings are not usually required for structural loads, but in cases where such loads are expected, sand castings could be used under special circumstances. In general, light alloy castings are lightly loaded and the tendency is to save on weight on each casting design. Thin webs and ribs, small boss diameters, together with small machine areas and "no draft" cores, are used extensively.

Proper dimensioning will avoid tolerance build-up (thus saving weight) and cost can be reduced by dimensioning to easy check points. These check points are also tooling points, for machining.

It is practical (in the initial project of casting design) to base boss diameters on the size of a washer calculated from the bolt dia-



Large light alloy sand casting for V-8 engine block.



Diffuser plate in aluminum. The casting weighed 8 lb.

meter required to secure the casting to the structure. To this diameter must be added the casting and drafting tolerances. The boss diameters are finalized by stress calculation and the diameters increased to a known factor without excess weight.

The minimum wall thickness for magnesium and aluminum alloy sand castings is 0.156 in. This could be cut to 0.13 in. under special circumstances by adding beads and cutting areas down.

The trend today appears to be toward uniformity of sections for the best physical properties; this greatly enhances the even cooling of castings. It is realized that uniformity of section cannot be maintained in all designs, but a good compromising design is often suitable.

The tolerances below may seem small (and the initial cost may be a high for casting pattern equipment) but the finish machining cost will be less.

Although sand castings are, in general, very versatile and more economical to specify, one must not forget the tolerances, which can have an adverse effect by not machining up to desired requirements.

Sand castings for economical detail production invariably have to be machined, jigs and fixtures being

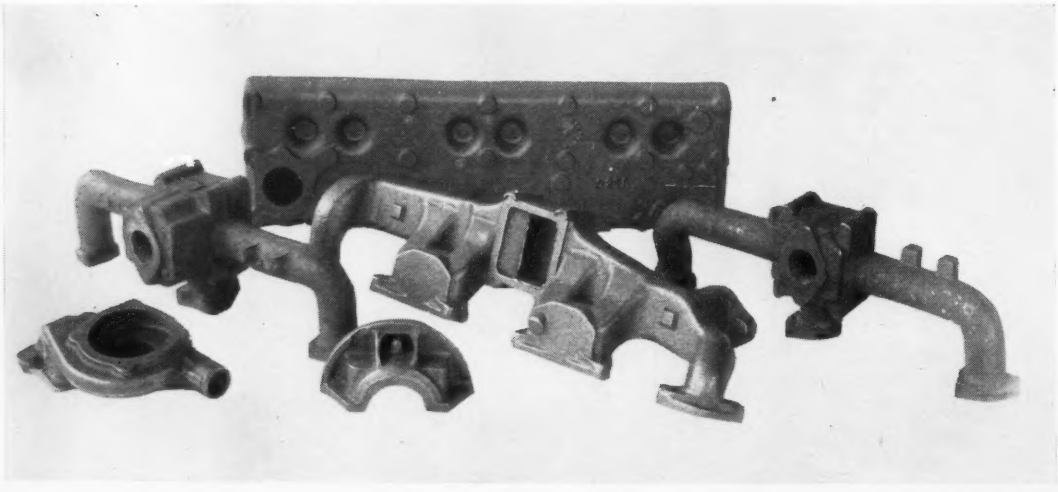
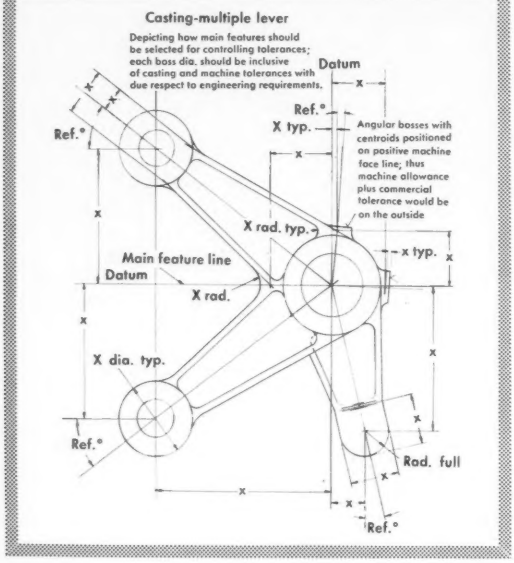


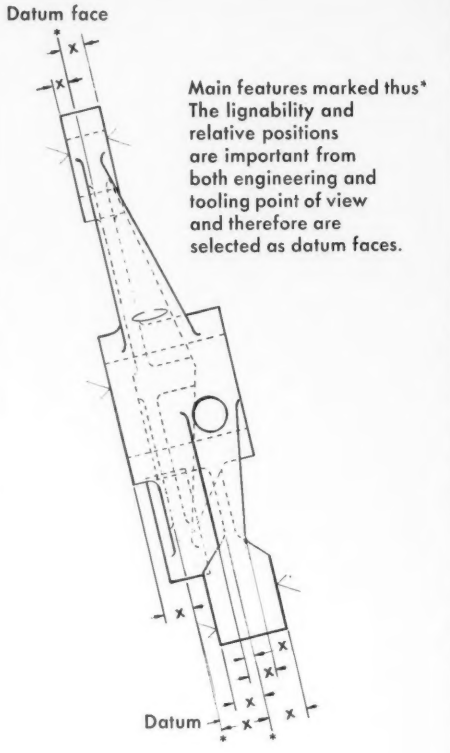
Table 2-1—Aluminum and magnesium sand casting alloys

	Heat-treatable	Castability	Corrosion resistance	Machinability	Remarks
Aluminum alloys					
100	No	Fair	Excellent	Fair	For electrical, food & beverage industries. Malleable alloy.
A111	Yes	Good	Fair	Good	For good mechanical properties plus high strength at elevated temperature.
117	No	Excellent	Fair	Good	General purpose, moderate strength medium alloy, for stressed castings.
123	No	Excellent	Excellent	Fair	For thin-walled castings and those subjected to atmospheric attack.
125	Yes	Excellent	Fair	Good	Stressed castings of intricate shape requiring good mechanical properties and machinability.
135	Yes	Excellent	Excellent	Good	For high strength, corrosion resistance, pressure-tightness and dimensional stability on temp. variation.
225	Yes	Good	Fair	V.G.	Machine parts or stressed castings requiring high strength and ductility.
236	No	Good	Fair	V.G.	General purpose alloy with moderate strength. For medium stressed castings requiring good machining.
250	Yes	Good	Fair	Good	For engine parts needing good strength at elevated temperature, good wear resistance and hardness.
A320	No	Good	Excellent	Excellent	For architectural, ornamental and marine uses. Good finish and corrosion resistance.
350	Yes	Good	Excellent	Excellent	Has the highest combination of mech. properties; corrosion resistant and machinability of any all sand cast alloy.
Frontier 40-E	None required	Good	Good	Excellent	Shows particularly good shock resistance combined with high yield strength and pressure tightness.
Magnesium alloys					
AZ 80	Yes	Good		Excellent	Good ductability and strength.
AZ 91	Yes	Good		Excellent	Similar to AZ92 except for higher ductility when aged. OK for structural parts needing strength and ductility.
EZ 33		Excellent			Relatively low mechanical properties at room temperature with exceptionally good creep properties up to 500 F and for parts subject to fluid pressure.
AZ 92		Good		Excellent	General purpose alloy. High tensile and yield strengths with relatively low ductility in aged condition. OK for engine parts at temp. below 300 F.
Magnesium-zirconium alloys					
H232		Excellent			Good room temperature properties coupled with excellent creep properties at temperatures up to 650 F. Not subject to microporosity. Recommended for engine parts with operating temperatures up to 650 F and parts subject to fluid pressure.
ZH 62		Good			Good weldability. Recommended for special applications requiring maximum mechanical properties.
ZK 51		Good			Good pressure tightness. Recommended for complex castings requiring low microporosity.

used to maintain interchangeability. To justify the best machining results to fixed settings, the jigs and fixtures have to locate on stable faces of the casting for each machining operation.

To tie in with the above, some very complicated sand castings were selected and laid out dimensionally. The lines marked "datum" are faces where the jigs or fixtures locate. This layout method tends to put casting tolerances on to faces that will be machined, and thus will be disposed of.

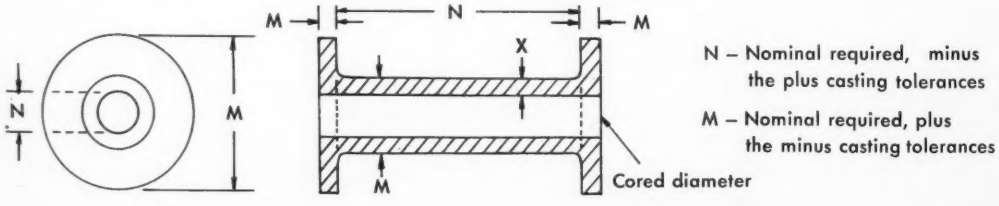


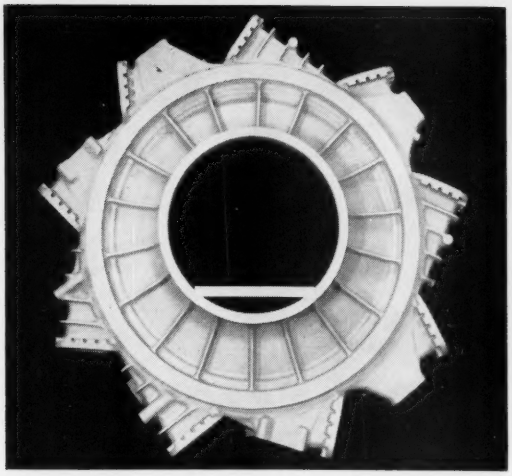


FOR CASTINGS TO 8 IN. LINEAR

Draft	Mismatch	Straightness	Wall thickness	Datum lines	Centre-to-centre	Centre to faying surfaces	Machine allowance per required face
1½° ±½°	.016	.016	±.016	±.016	±.016 min. add .002 p.i. over 4 in. linear	±.03 min.	.130 inclusive of all tolerances

For castings beyond .32 in. linear dimensions, use the above table with minimum tolerances and increments. One point to note when drafting for a casting: the dimensions affected by plus tolerances should be deducted (or added, as the case may be) or the casting will not be serviceable after machining.





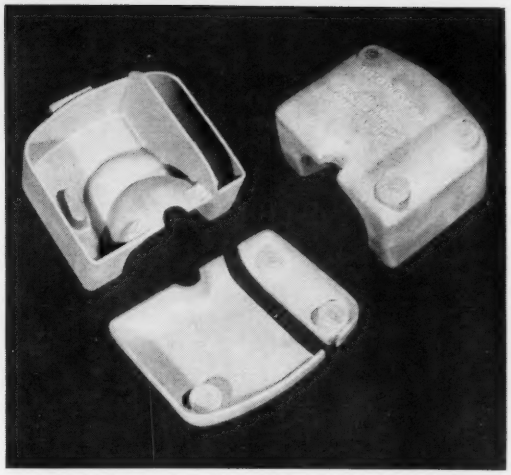
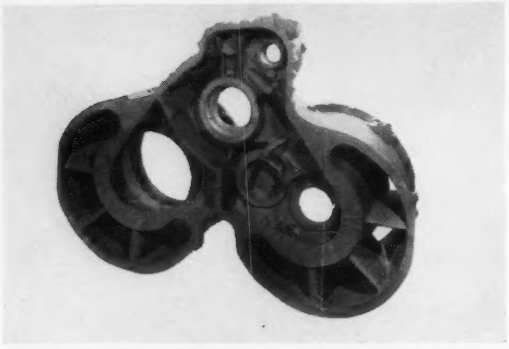
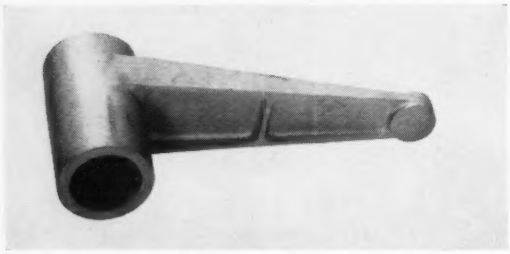


Table 2-2—Mechanical properties: aluminum and magnesium sand casting alloys

Minimum values for specification			Typical values (not guaranteed)						
	Tension		Tension			Compression	Hardness	Shear	Fatigue
Alloy	Ultimate strength (psi)	Elongation (percent on 2 in.)	Ultimate strength (psi)	Yield strength (psi)	Elongation (percent on 2 in.)	Yield strength (psi)	Brinell 500 kg load, 10 mm ball	Shear strength (psi)	Endurance limit (psi)
Aluminum alloys									
A111-T5	24,000	2.5	25,500	15,500	3.5	—	—	—	—
117	20,000	1	25,000	16,000	3.5	16,000	65	23,000	10,000
123	17,000	3	19,000	9,000	9.0	10,000	40	14,000	6,500
125-T6	32,000	2	38,000	35,000	2.5	29,000	80	30,000	8,500
125-T6A	37,000	—	45,000	40,000	2.0	37,000	90	32,000	8,500
125-T5	25,000	—	28,000	23,000	1.5	24,000	65	22,000	7,000
135-T6	30,000	3	36,000	25,000	4.0	22,000	70	27,000	8,000
135-T5	23,000	—	25,000	20,000	2.0	22,000	60	18,000	7,500
225-T6	32,000	3	39,000	28,000	5.0	25,000	80	30,000	6,500
236	20,000	—	22,000	14,000	2.0	17,000	65	20,000	8,000
250-T5 B	23,000	—	25,000	20,000	1.0	—	75	21,000	9,500
250-T6	30,000	—	36,000	30,000	1.0	—	100	29,000	—
A320	20,000	4	24,000	13,000	6.0	13,000	50	17,000	5,500
350-T4	42,000	12	45,000	25,000	14.0	26,000	75	33,000	7,000
Frontier 40-E			35,000	25,000	5.0	17,000	75	26,000	9,000
Magnesium alloys									
AZ 80 as cast	23,000		26,000	14,000	3-5				
Solution H.T.	32,000		38,000	14,000	7-15				
H T. and aged	32,000		39,000	19,000	4-6				
AZ 91 as cast	20,000		24,000	14,000	1-4				
Solution H.T.	32,000		35,000	15,000	6-10				
H.T. and aged	34,000		40,000	21,000	1-4				
Stabilized	20,000		25,000	14,000	1-3				
Magnesium-zirconium alloys									
HZ 32-T5			32,000	14,000	10				
ZH 62-T6			42,000	26,000	9				
ZK 51-T5			31,000	20,000	6				
EZ 33-TS			23,000	16,000	3				

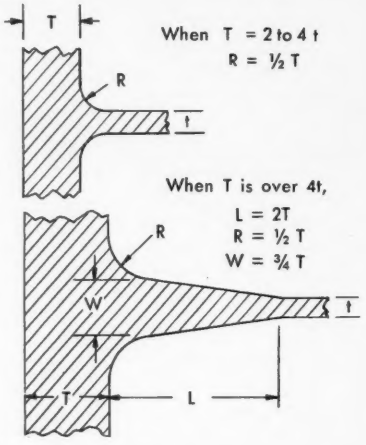


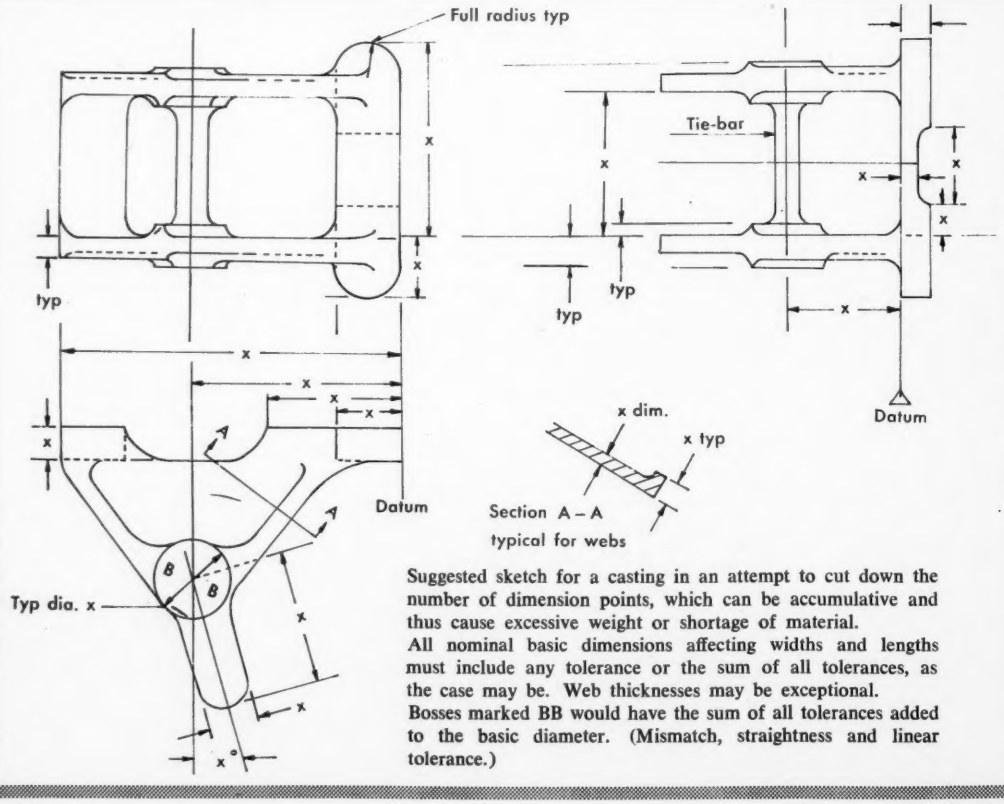
Double Mamba engine casing sand cast in Magnuminium



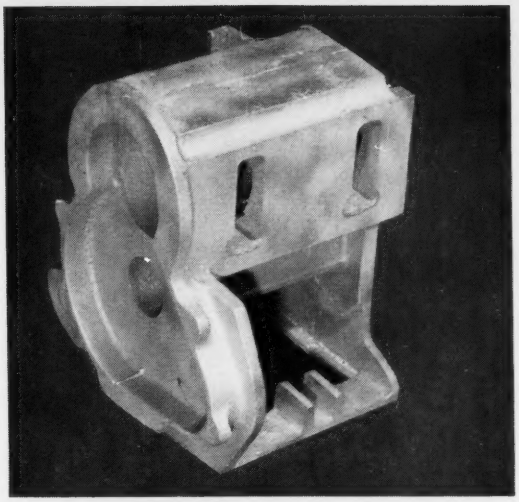
Lever was sand cast from aluminum and weighed 3 lb.

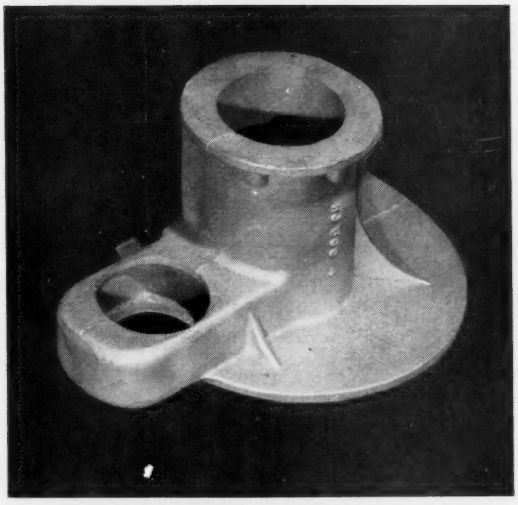
The fillet radii should be the same as the wall thickness, where the walls are of equal thickness. Where thick walls join thin walls, the following is a possible standard.

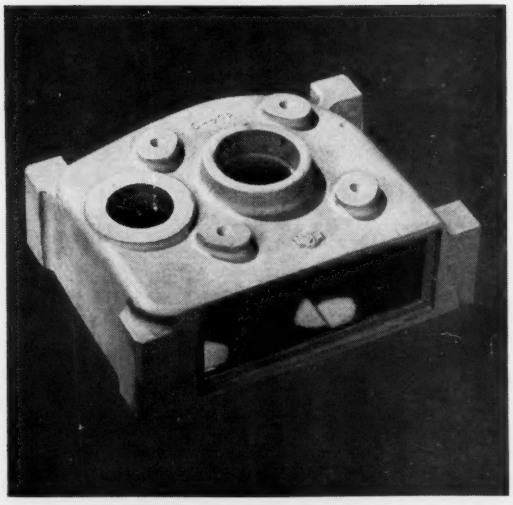


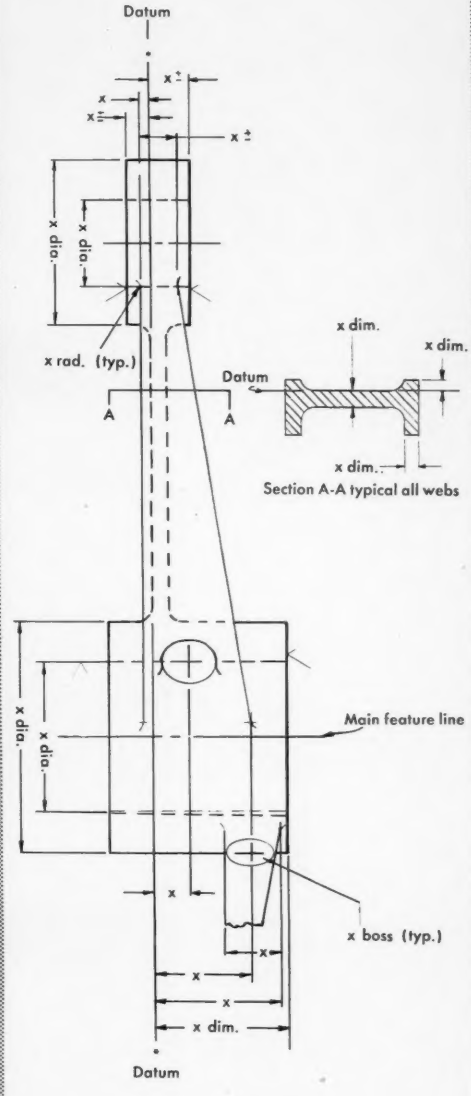


Suggested sketch for a casting in an attempt to cut down the number of dimension points, which can be accumulative and thus cause excessive weight or shortage of material.
All nominal basic dimensions affecting widths and lengths must include any tolerance or the sum of all tolerances, as the case may be. Web thicknesses may be exceptional.
Bosses marked BB would have the sum of all tolerances added to the basic diameter. (Mismatch, straightness and linear tolerance.)









Main features marked thus*
The lignability and relative positions are important from both engineering and tooling point of view and therefore are selected as datum faces.

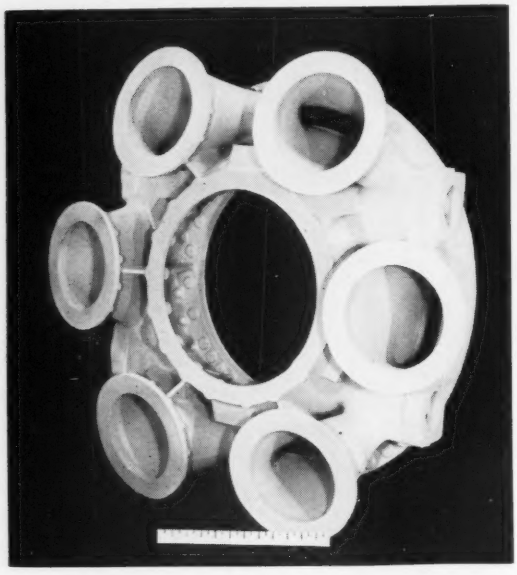
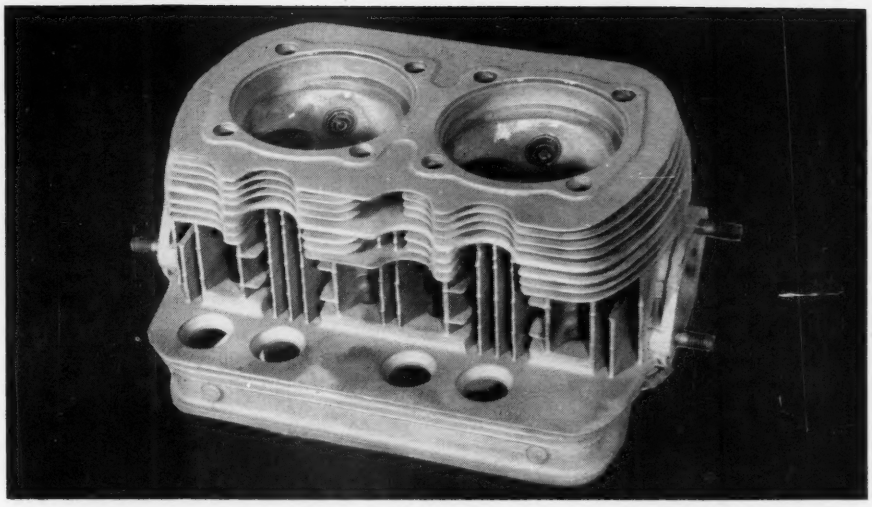


Table 2-3—Typical physical properties: aluminum and magnesium sand casting alloys

Alloy	Weight (lb per cu in.)	Approximate solidification range (deg. C)	Electrical conductivity (percent of International annealed copper standard)	Thermal conductivity at 25 deg. C (cgs units)	Coefficient of linear expansion x 10^6 (Per deg C from 20 deg to 100 deg C)
Aluminum alloys					
123	0.097	630-575	37	0.35	22.0
125-T6	0.098	625-580	36	0.34	22.0
125-T6	0.098	625-580	39	0.36	
125-T5	0.098	625-580	43	0.40	
135-T6	0.097	610-580	39	0.36	21.4
135-T6	0.097	610-580	41	0.38	
135-T5	0.097	610-580	43	0.40	
225-T6	0.101	645-550	37	0.35	22.8
236	0.104	630-525	27	0.26	22.0
250-T58	0.106	625-540	41	0.38	22.0
250-T6	0.106	625-540	33	0.31	
250	0.106	625-540	34	0.32	
A320	0.094	630-590	36	0.34	
350-WT4	0.093	620-450	21	0.21	24.5
Frontier 40-E	0.100		25		13.7
Magnesium alloys					
AZ 80 x	0.065	610-530	19	0.18	25.6
AZ 91 x	0.065	600-510	19	0.16	25.0

Note: cgs units: calories per sec per sq cm per cm of thickness per deg.



Die casting

A method giving close tolerances and high surface finish

Die castings are made by forcing molten metal under pressure into steel dies. They have achieved their popularity because of the close tolerances and high degree of surface finish possible at relatively low cost in volume production.

The dies are fairly expensive, but as a mass-production process die-casting does away with expensive machining and finishing operations, and saves money in the long run.

Although die castings can be used in the "as-cast" state, a number of commercial finishes are available for improving their appearance and for combating corrosion. Chemical treatments for aluminum consist of acid etches, hot alkaline, anodizing and other processes. Aluminum lends itself to enamels, lacquers, paints and varnishes (after shot-peening, or some other surface roughening process), or plating with copper, nickel and chromium.

Automatic metering in magnesium die casting

Magnesium die castings, produced by the cold chamber method with an automatic metering system, are becoming popular. One large electrical manufacturing firm in the U. S. has installed two machines and is producing magnesium and shields for fractional-hp motors by this method. Basically, the system works like this: the molten magnesium alloy is charged into a heated steel holding pot which is flux protected. From here the metal is gravity fed through a heated tube to a control valve which meters into a shot well. (Below). All the operator has to do is push a die close button and remove the casting. Die lubrication is automatic. Castings weighing around 1½ lb have been produced at the rate of 240 shots per hr.

Besides offering high rates of production, the system is flexible, for it allows the operator to hand-ladle aluminum on the same machine by moving the metering attachment out of the way.

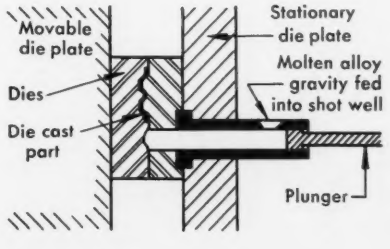
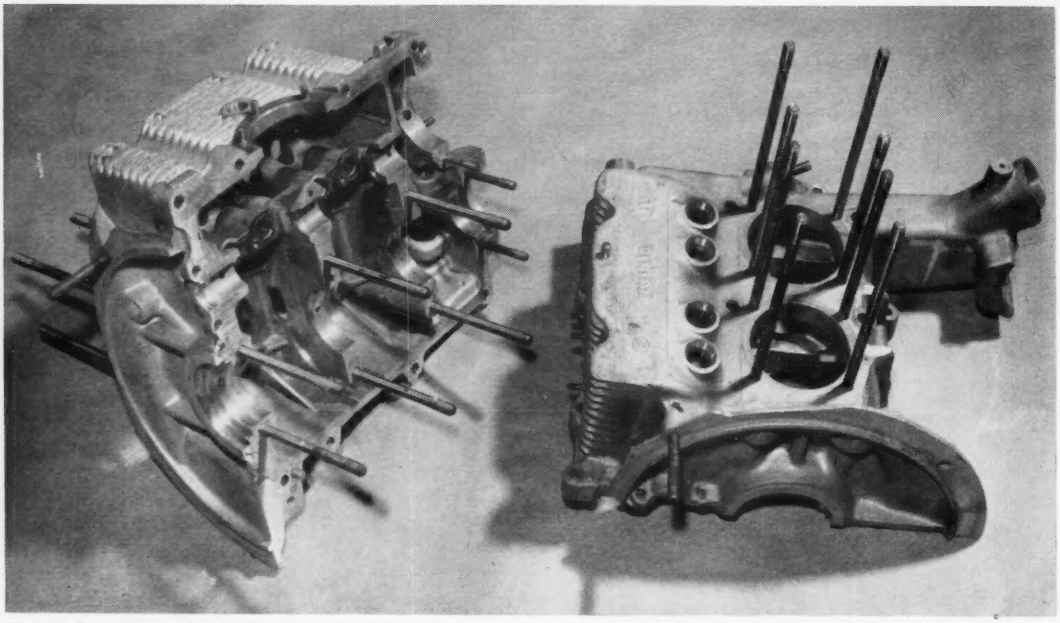


Table 3-1. Aluminum and magnesium die casting alloys

	Heat-treatable	Castability	Corrosion resistance	Machinability	Remarks
Aluminum alloys					
143	No	Very Good	Fair	Good	General purpose alloy with good mechanical properties
160X	No	Excellent	Good	Fair	General purpose alloy for intricate parts with thin sections, such as instrument cases or outboard motor pistons
340	No	Good	Execllent	Excellent	Excellent strength, durability, corrosion resistance. Good finishing characteristics
Magnesium alloys					
AZ91		Good	Poor	Excellent	Offers thin-walled castings, is fast machining and has good damping characteristics. Used for electric motor end shields and stators, typewriter frames, cases and parts; automotive fuel pumps

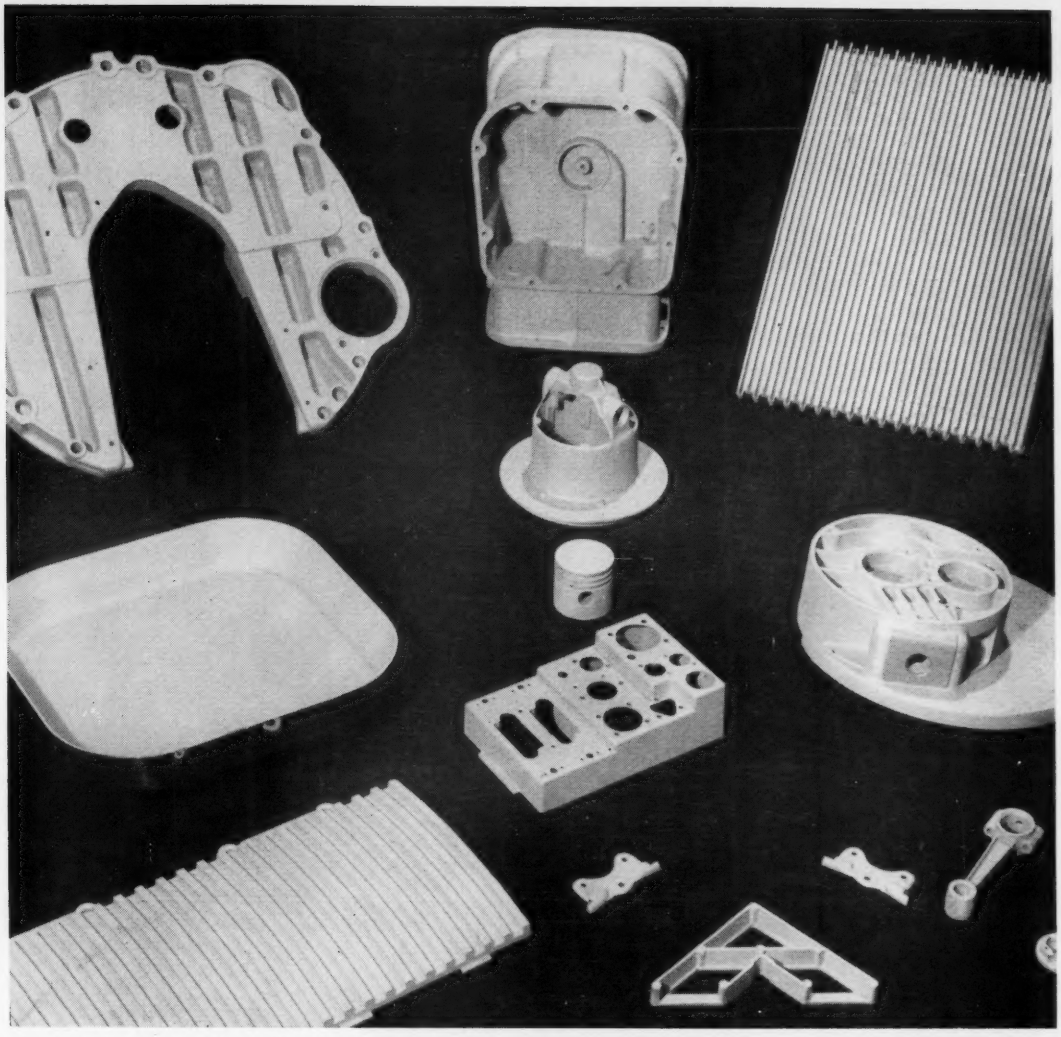


Two halves of an intricately finned crankcase. They form part of the air-cooled powerplant of the Volkswagen.

Table 3-2. Mechanical properties of die casting alloys

(Typical, not guaranteed, values)

Alloy	Ultimate strength (psi)	Tension		Shear	Fatigue
		Yield strength (psi)	Elongation (percent on 2 in.)	Shear strength (psi)	Endurance limit (psi)
Aluminum alloys					
143	41,000	20,000	3.0	24,000	—
160X	35,000	18,000	3.5	22,000	15,000
340	41,000	23,000	7.0	23,000	18,000
Magnesium alloys					
AZ91	35,000	20,000	2-5	20,000	14,000



A wide range of castings, both in size and intricacy. Every item in the picture was die cast from aluminum.

Design hints (die casting)

Here are some points that are considered important:

- Selection of alloy to be used is of great importance. The choice depends on its physical characteristics in the "as cast" state and in the molten state under casting conditions. Most die casters have a favorite alloy that is economical to cast, and is suitable from a handling and a trouble-free standpoint.
- All corners that must be sharp should be identified, although fillets and radii are preferable.
- The casting should be designed to have a wall stock as nearly uniform as possible, with a gradual transition to a different thickness.
- Inserts may sometimes be justified but must be designed for positive location and locking in the die.
- Large flat surfaces should be avoided, particularly where appearance is important in the final assembly.

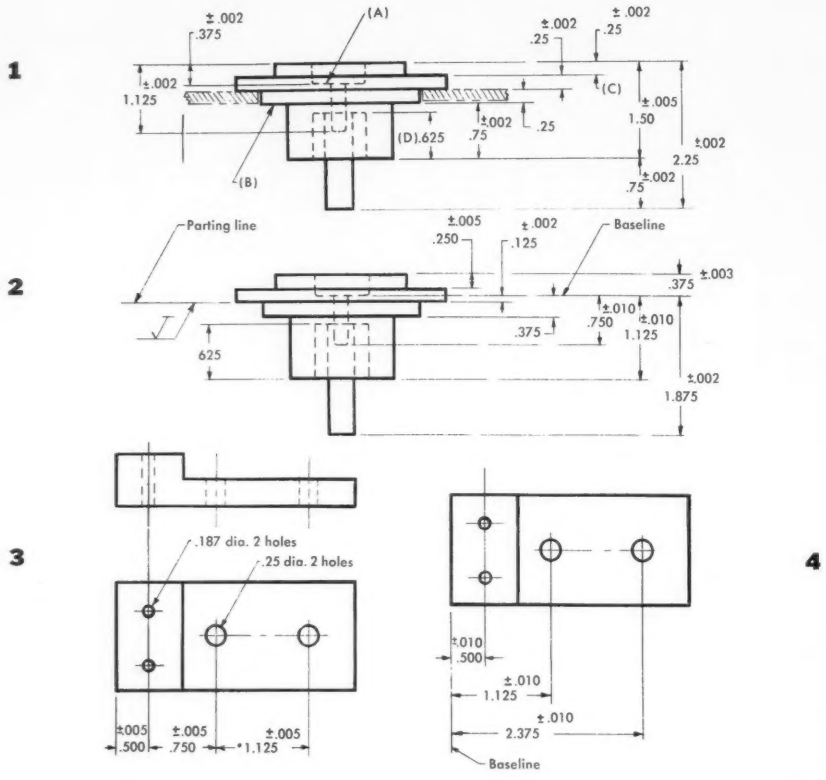
Minimum wall thickness:
Should be 0.062 in. for small aluminum castings, with a comparable increase for larger castings.

Minimum draft:
Outside walls: ½ deg. minimum.
Inside walls: 1 deg. minimum.
⅛ to ¼ in. cores: 0.020 per in. for aluminum.
¼ to 1 in. diameter cores: 0.016 per in. for aluminum.

Minimum tolerances:
Aluminum ± 0.003 in. for first inch. Add ± 0.001 in. for each additional linear inch.

Core size:
5/32 in. dia. is the minimum core size for aluminum. The maximum depth of a cored hole should not be more than 4 times the hole diameter.

Dimensioning for die casting



In all die-casting designs in which close dimensions must be held, it is desirable to choose a "base-line" (actually a surface) to which all dimensions can be referred. This surface is preferably one that remains as cast and one that is substantially unchanging throughout the die life, so that it is unaffected by wear, especially of moving parts. The surface thus chosen becomes the locating surface in machining fixtures and for gauging, and insures the casting will clean up when machined.

Selection of the base-line is determined by those dimensions that are a necessity and have to be held to fairly close limits so that the item will perform its function and mate properly with other parts of an assembly and will clear other parts, where clearances are essential.

Dimensions that determine interchangeability are of first importance; dimensions that make "No Fit" and govern "No Clearances" are secondary.

For economy, the die-cast designer often selects two or more different baselines and by making a study of their effect upon casting, machining and gauging, chooses the one that best meets the conditions imposed.

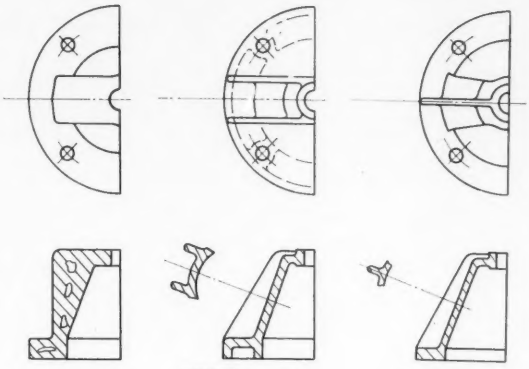
Fig. 1 shows a drawing as it might be submitted to a die-casting vendor. The casting must mount against the flange shown shaded. A critical dimension is the distance from surface (A) to the seated flange surface. (B) is a step diameter that locates the part transversely. Dimension (D) .625 is the depth of a clearance recess. Dimension (C) is important but not critical.

Fig. 2 shows how the drawings should be submitted with dimensions from the base line, so chosen as to meet all essential requirements. The height of the bottom boss and the distance from the base line to the flange seat are held by machining with the casting located against the base surface. Machining removes flash at the parting and the .125 and 1.875 dimensions are held within the limits set. The remainder of the dimensions (which carry less than $\pm .010$ tolerance) are in the solid or same half of the die and can be held without machining. Thus, the base-line chosen fulfills the requirements and provides for minimum machining.

Fig. 3 shows the cumulative tolerances that result when the dimensions are given in the wrong way. They are often a source of trouble. The first .25 dia. hole as here dimensioned can come $\pm .010$ from the left end and the second .25 dia. hole $\pm .015$ from the end.

Fig. 4 shows the correct dimensioning of each hole from the base line; this allows the die caster wider tolerance but still meets the customer's requirements.

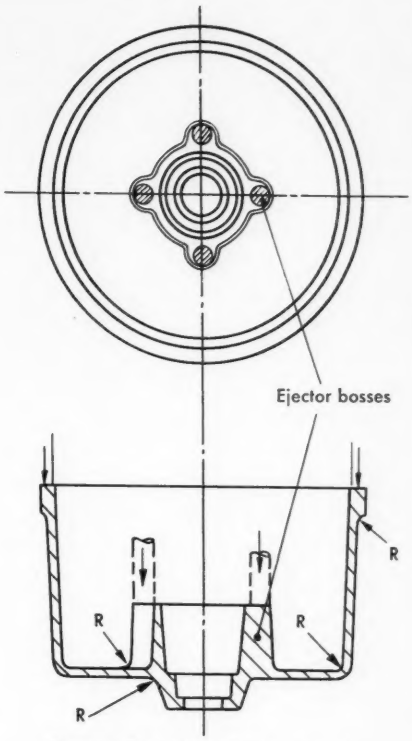
Design hints (die casting)



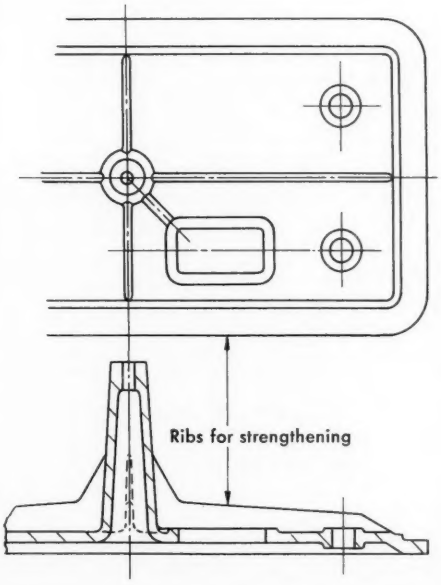
A Unsuitable excess wall thickness danger of porosity.

B Porosity localized to heavy 'U' section

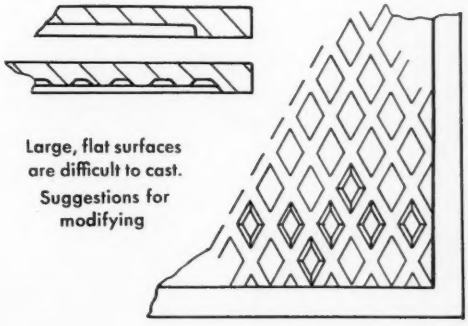
C Heavy sections eliminated



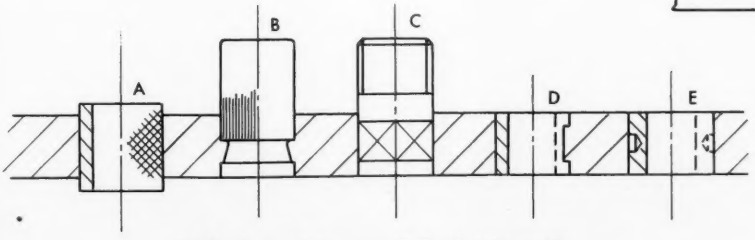
Tapers, ejector bosses and fillet radii



Ribs for strengthening



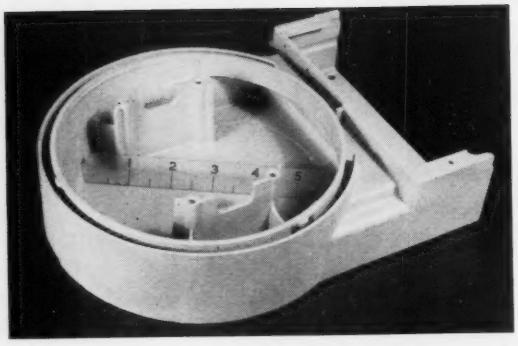
Large, flat surfaces are difficult to cast. Suggestions for modifying

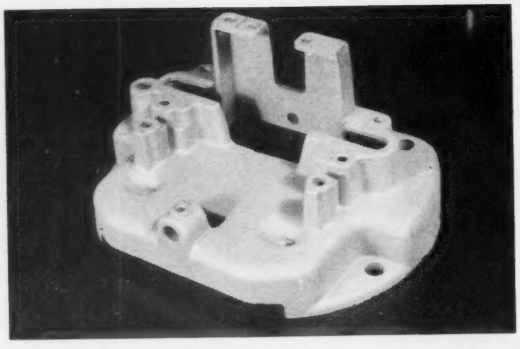


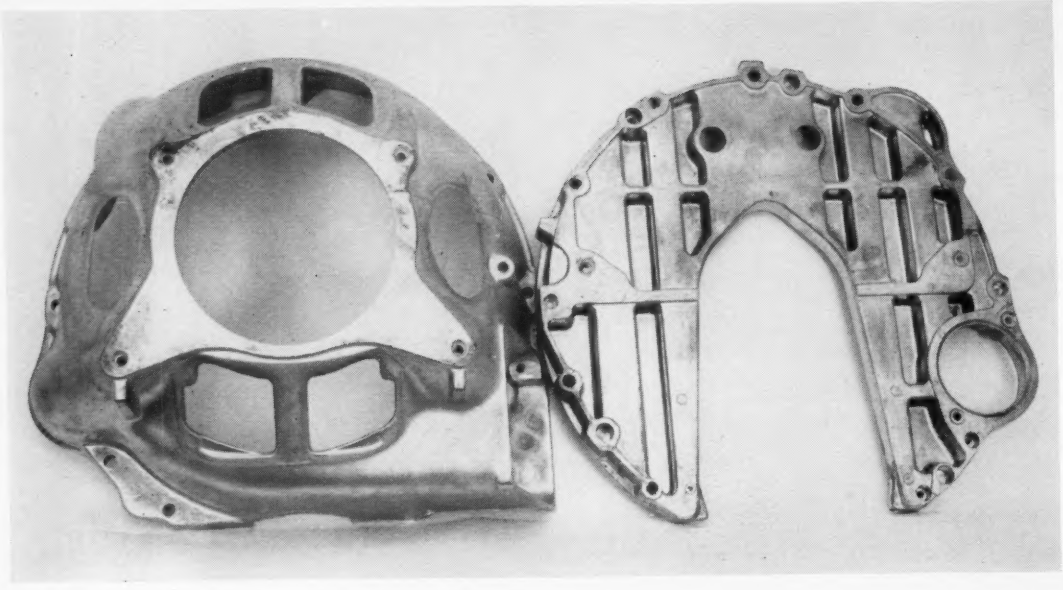
Methods used to prevent "cast-in" inserts from twisting or pulling out

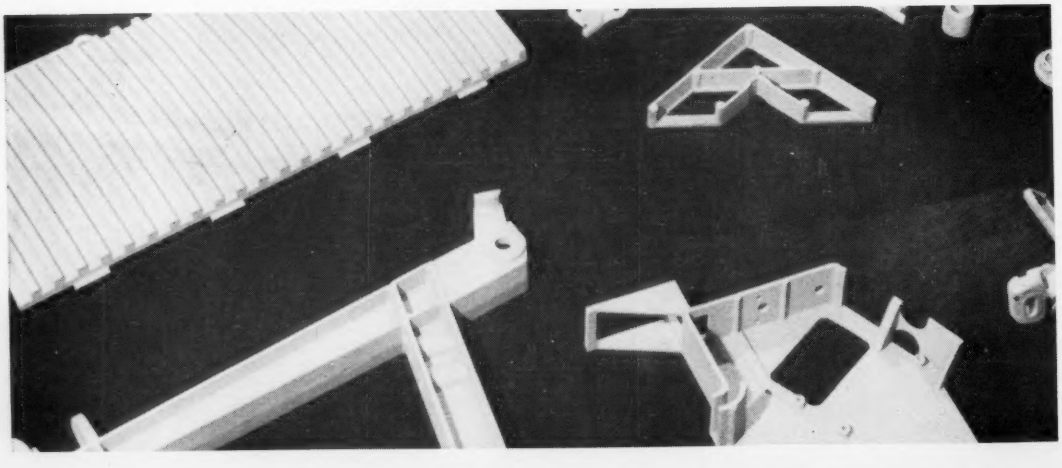
"A" – Knurl O/D
"B" – Vertical grooves and u/cut
"C" – Flats on O/D
"D" – Slots
"E" – Horizontal holes

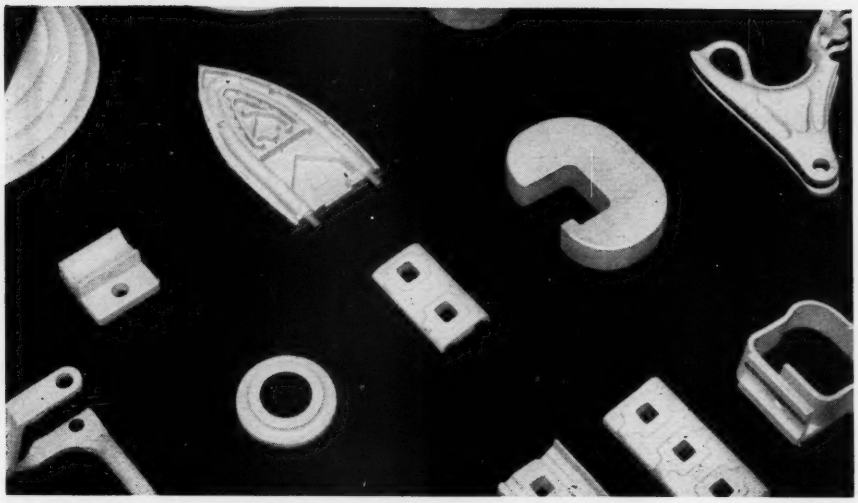
Sample die cast parts











Permanent mold casting

Finer grain than sand castings, denser than die castings

The main difference between permanent mold casting and sand casting is that a metal mold is used in place of sand, the dies usually being of steel or high alloy iron. Less machining and polishing is required than with sand castings.

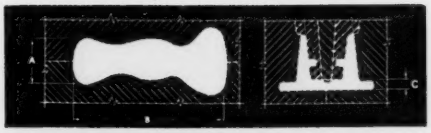
Since they are chill-cast, permanent-mold castings have a finer grain than sand castings. The metal is gravity poured (as for a sand casting) and so the density of a permanent mold casting is greater than that of a die casting.

When there are cavities in the casting, from which straight cores cannot be withdrawn, the **semi-permanent mold** process is used. Instead of the permanent steel cores, destructible coring compositions are used, as in sand casting. These may be made of sand, resin-sand (shell), plaster or other material. In some cases (where design and economy permit) a collapsible steel core, instead of a destructible core, may be used. Permanent metal coring is, of course, the cheapest method.

The commercial tolerances for permanent-mold castings are shown in the Table. Closer tolerances may be obtained and must be shown on the approved drawing. Where the foundry agrees to reduce the minimum draft or dimensional tolerance, the castings and equipment may cost more and there will be a lower production rate from the mold.

Dimensional tolerances

Dimension	Tolerance (in.) Under 1 in.		For each inch (or portion thereof) in excess of 1 in.
Across the parting line (A)	+1/64	—1/64	Increase by .002 in.
Between points produced by one part of the mold (B)	+1/64	—1/64	Increase by .001 in.
Between points produced by the core and the mold (C)	+1/64	—1/64	Increase by .002 in.



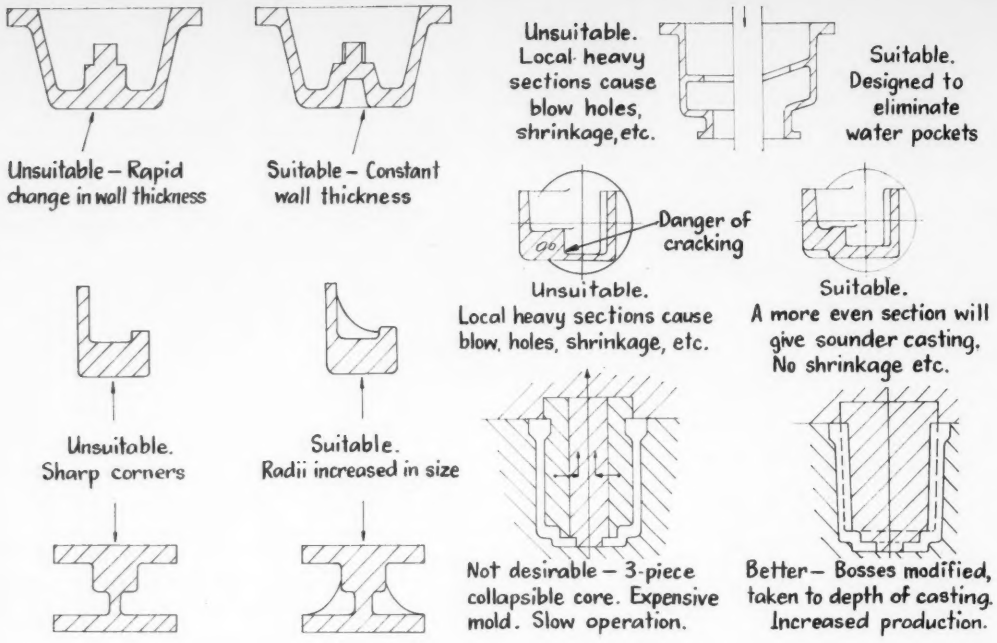
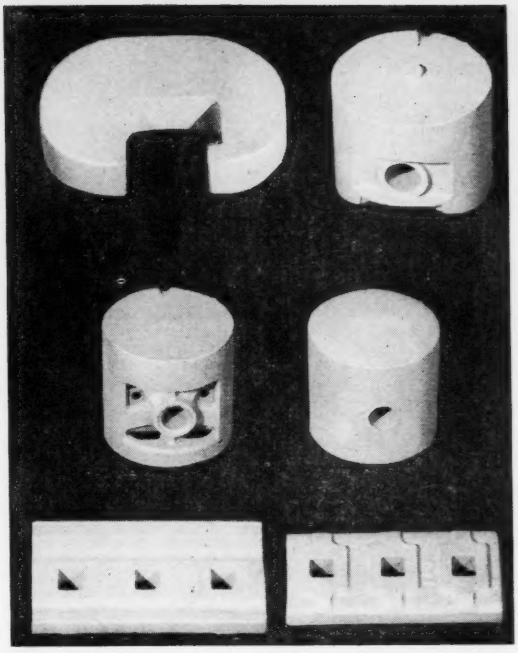


Table 4-1. Aluminum and magnesium permanent mold castings

	Heat-treatable	Castability	Corrosion resistance	Machinability	Remarks
Aluminum alloys					
117	No	Excellent	Fair	Good	General purpose, moderate strength alloy used for medium stressed castings.
123	No	Excellent	Excellent	Fair	Used for thin-walled castings and those subject to atmospheric attack.
125	Yes	Excellent	Fair	Good	Stressed castings of intricate shape requiring good mechanical properties and machinability.
135	Yes	Excellent	Excellent	Good	Used where requirements indicate high strength, corrosion resistance, pressure tightness or dimensional stability on temperature variation.
162	Yes	Good	Good	Good	The low coefficient of internal expansion, good wear resistance and good strength at elevated temperature, make this an excellent piston alloy.
236	No	Good	Fair	V.G.	General purpose alloy with moderate strength. For medium stressed castings requiring good machining.
250	Yes	Good	Fair	Good	Used for engine parts requiring good strength at elevated temp., good wear resistance and greater hardness.
Magnesium alloys					
AZ 80	Yes	Good		Excellent	Automotive parts, transmissions, housings, etc.
AZ 91	Yes	Good		Excellent	



Parts shown above were permanent mold cast in aluminum. Included are a washing machine agitator and pistons.

Higher mechanical strength of these castings allows thinner sections

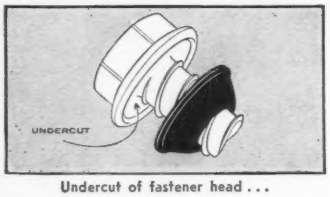
Table 4-2. Mechanical properties of aluminum and magnesium permanent mold casting alloys

	Minimum Values for Specification		Typical values (not guaranteed)						
	Tension		Tension			Compression	Hardness	Shear	Fatigue
Alloy	Ultimate strength (psi)	Elongation percent (on 2 in.)	Ultimate strength (psi)	Yield strength (psi)	Elongation percent (on 2 in.)	Yield strength (psi)	Brinell (500 kg load 10 mm ball)	Shear strength (psi)	Endurance limit (psi)
Aluminum alloys									
117	24,000	2.0	29,000	18,500	4.0	20,000	70	25,000	12,000
123	21,000	5.0	22,500	9,000	10.0	9,000	40	18,000	—
125-T6	37,000	1.5	42,000	35,000	3.0	—	90	30,000	—
125-T6A	40,000	—	45,000	40,000	2.0	—	—	—	11,000
125-T5A	27,000	—	31,000	24,000	2.0	24,000	75	—	—
135-T6	33,000	3.0	36,000	27,000	6.0	27,000	90	29,000	12,500
A143-T5	31,000	—	34,000	31,000	1.5	—	100	—	—
162-T4	34,000	—	38,000	30,000	1.5	—	100	29,000	—
162-T5A	31,000	—	36,000	28,000	0.5	30,000	105	24,000	—
236	20,000	—	29,000	19,000	2.0	—	—	—	—
250-T50	30,000	—	37,000	35,000	—	—	115	27,000	—
250 T6A	40,000	—	48,000	36,000	—	—	140	40,000	—
Magnesium alloys									
AZ80-F	23,000	—	26,000	14,000	3-5	14,000	50	18,000	11,000
AZ80-T4	34,000	7.0	38,000	14,000	7-15	14,000	52	19,000	12,000
AZ80-T6	34,000	3.0	39,000	19,000	4-6	20,000	62	23,000	12,000
AZ91-F	20,000	—	24,000	14,000	1-4	14,000	52	18,000	12,000
AZ91-T4	34,000	6.0	35,000	15,000	6-10	15,000	54	20,000	14,000
AZ91-T6	34,000	3.0	40,000	21,000	1-4	22,000	66	24,000	13,000
AZ91-T2	20,000	3.0	25,000	14,000	1-3	16,000	55	19,000	12,000

News about NEOPRENE

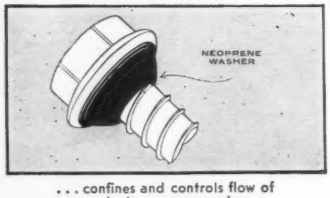
NEOPRENE washers are integral part of leakproof, cushioned fastener

A combination of an undercut head design and a conically shaped neoprene washer gives special advantages to these fasteners.



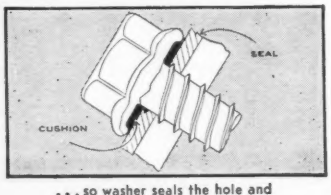
Undercut of fastener head . . .

The washer cushions the head and prevents metal-to-metal contact. Finishes are protected; transmission of vibration noise and squeaks is reduced.



. . . confines and controls flow of conical neoprene washer

As the fastener is secured, the undercut head confines and controls the spread of the resilient neoprene washer, which, in turn, flows into the top threads and seals the fastener hole.



. . . so washer seals the hole and cushions the fastener head.

It's another example of good design made possible with a part made of neoprene—the Du Pont synthetic rubber that is used throughout the automotive industry for resistance to oil, ozone and weather. Just clip the coupon for more information.

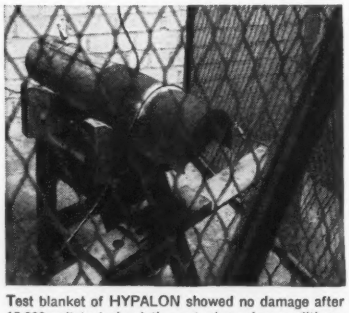
Lineman's blankets of HYPALON* take 15,000-volt shock for 147 test hours without damage

HYPALON retained full insulating value in test that burned through ordinary rubber in 12 minutes

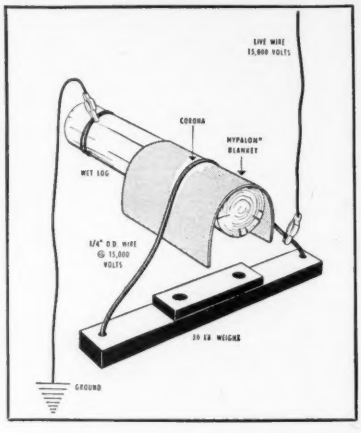
Telephone poles often carry power lines in addition to telephone wires. When a pole needs replacement, telephone linemen usually do the job if power line voltage doesn't exceed 15,000 volts. In jockeying a new pole into position it may brush against the power wires. If the pole is wet it is conductive enough to be dangerous. Wet or not, linemen protect themselves against possible electrocution by wrapping the top of the pole with insulating rubber blankets.

Natural rubber blankets have high insulating value, but are vulnerable to corona cutting and deterioration from sunlight and weather. At the first sign of a cut or burn they must be discarded.

The extraordinary resistance of HYPALON synthetic rubber to ozone, sunlight and other oxidizing agents suggested its use for linemen's blankets to engineers at Bell Telephone Laboratories in Murray Hill, N. J.



Test blanket of HYPALON showed no damage after 15,000-volt test simulating actual service conditions. Test was discontinued after 147 hours.



Bell engineers devised a test closely simulating actual service conditions (see sketch). They soaked a pole stub in water, grounded it, draped a blanket over it, pressed a ¼-in. copper conductor against the blanket and applied 15,000 volts. Resultant arcing produced constant corona and evolved strong ozone. Ordinary rubber blankets failed quickly . . . some in 12 minutes. But a blanket of 100% HYPALON withstood 147 test hours with no corona cuts, ozone cracks or burn-throughs. Longer testing was considered unnecessary.

Performance like this makes HYPALON an excellent choice for parts or products subject to ozone, corona or strong oxidizing conditions. Mail the coupon for details on how this Du Pont synthetic rubber can help you in designing new products and improving old ones.

***HYPALON** *is a registered trademark of E. I. du Pont de Nemours & Co. (Inc.)*

ELASTOMERS IN ACTION HYPALON® • NEOPRENE

DE-8

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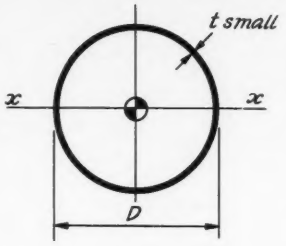
More section properties

THIN-WALLED CIRCLE



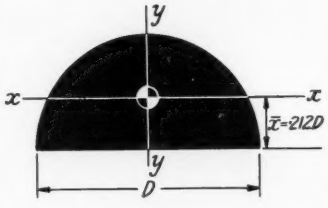
$$A = \pi Dt$$

Moment of inertia about xx (or any diameter)

$$I_{xx} = \pi/8D^3t$$

$$Z_{xx} = \pi/4D^2t$$

SOLID SEMICIRCLE



$$A = \frac{\pi}{8} D^2 = .3927D^2$$

$$\bar{x} = \frac{2}{3}\frac{D}{\pi} = .212D$$

$$I_{BB} = \frac{\pi}{128} D^4 = .02454D^4$$

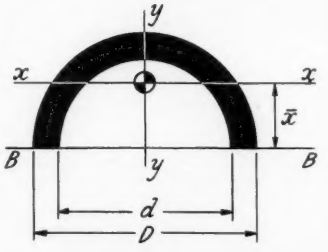
$$I_{xx} = I_{BB} - A\bar{x}^2 = .0069D^4$$

$$I_{yy} = \frac{\pi}{128} D^4 = .02454D^4$$

$$\rho_{xx} = .132D$$

HOLLOW SEMICIRCLE

(not thin-walled)



$$A = \frac{\pi}{8} (D^2 - d^2)$$

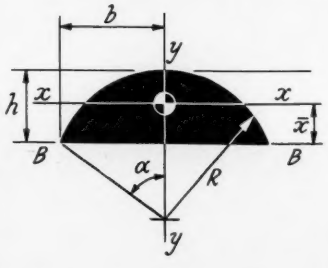
$$\bar{x} = \frac{2(D^3 - d^3)}{3\pi(D^2 - d^2)}$$

$$I_{BB} = \frac{A}{16} (D^2 + d^2)$$

$$I_{xx} = I_{BB} - A\bar{x}^2$$

$$I_{yy} = \frac{A}{16} (D^2 + d^2)$$

CIRCULAR SEGMENT



$$R = \frac{b^2 + h^2}{2h}$$

$$A = \frac{R^2}{2}(2\alpha - \sin 2\alpha) \quad \text{where } \alpha \text{ is in radians}$$

$$\bar{x} = \frac{2}{3}\frac{b^3}{A}$$

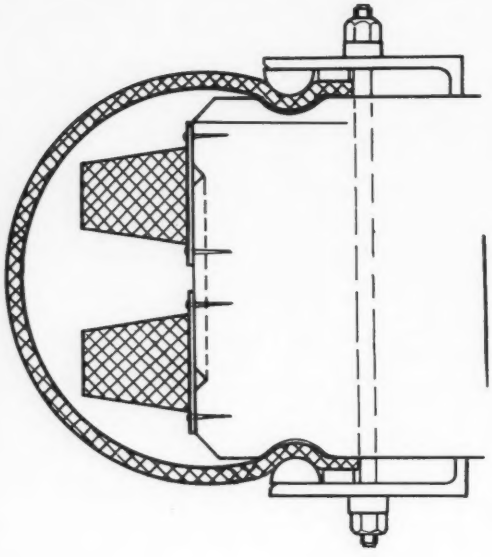
$$I_{BB} = \frac{R^4}{4}[\alpha - \tfrac{1}{2} \sin 2\alpha + \sin^2 \alpha \sin 2\alpha]$$

$$I_{xx} = I_{BB} - A\bar{x}^2$$

$$I_{yy} = \frac{R^4}{4}[\alpha - \tfrac{1}{2}(1 + \tfrac{2}{3} \sin^2 \alpha) \sin 2\alpha]$$

Ideas round-up

Gasket: leakproof seals for an underwater tunnel



A Canadian contribution to the building of rectangular underwater tunnels is the rubber-seal gasket designed by **Gutta Percha and Rubber Co. (Canada)** for Vancouver's new Deas Island Tunnel. The tunnel will carry four lanes of traffic from Vancouver Island south to a superhighway and will pass beneath the Fraser River.

The tunnel segments (each 18,500 tons in weight) were built in dry-dock and sunk in position. The gasket (placed at one end only of each segment) provides a watertight seal against the river for 18 months. During this time, workmen will permanently complete the inside of the tunnel, joining the segments with concrete. The completed seal consists of two parts: a rubber gasket envelope similar to a huge inner tube; and rubber pads cemented to a steel plate which, in turn, were affixed to the concrete of the end of the segment. The end of the next section (without a seal) was slammed against the gasket at a pressure of 150 tons and then water at a pressure of 10 psi was pumped into the seal. A checkup after the sinking of the sections shows the seals to be working satisfactorily.

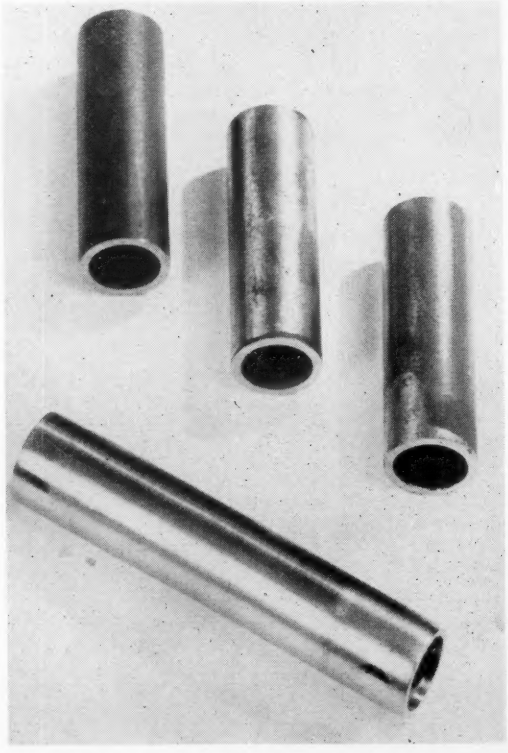
Rust: superiority of wax base preventives

Rust preventives made with a refined microcrystalline wax base (with inhibitors added) are most effective in protecting carbon and low alloy steel tubing, according to test findings of the metallurgical department of **Superior Tube Company.**

The film left by the wax-base rust preventive is somewhat duller than oil films and takes on a slightly yellowish cast. However, it is believed that the better protection offered by the wax-base material is well worth the small sacrifice in appearance, particularly as rust preventives are almost always removed before the tubing is used. The appearance of the rust is therefore of little importance.

The ability of this rust preventive to give long-lasting protection against rust is attributed to the impervious, tough film of wax which forms as the solvent evaporates. Microscopic examination shows the film to be tighter than oil films, although the latter may seem continuous to the naked eye.

The wax-base material has several other properties that make it desirable for use as a rust preventive. It is non-staining and is not slippery or messy to handle. It is non-irritating to the skin. It is reasonably attractive in appearance and is transparent, so that the fabricator can see the condition of the metal under the coating. Finally, it is economical. (208)



Continued on page 56

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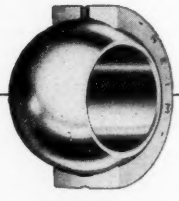
2 PIECE SPHERICAL BEARING

A brand new innovation in spherical bearing design

Through a series of controlled thermal, physical-chemical, and mechanical steps, the balls are made of high density, through-hardened powdered iron alloy, and the outer members are made of sintered iron or sintered bronze with controlled porosity.

Pressing and sintering procedures make it possible to produce a bearing which will hold up to 20% of its own volume in oil. This means longer bearing life with less frequent relubrication required. Manufacturer's tests on a 5/16" bore bearing at 1350 rpm with a 30 lb. load ran for 2000 hours with only weekly relubrication.



This cutaway view of the Unibal 2-piece spherical bearing shows how a coined (or swaged) type bearing presents a large surface-supporting area, and is capable of rotating so as to correct shaft misalignment in all directions.

These new Unibal spherical bearings of sintered metal cost less than comparable bearings of conventional materials.

Like all Unibal spherical bearings and rod ends, the new 2-piece bearing produced by powder metallurgy, will correct misalignment to the maximum degree.

Heim has been a leader in spherical bearings since their original development — an old hand with new ideas. This skill and experience can solve problems — and save money — on YOUR bearing requirements. Just call the nearest Heim bearing distributor or write direct for catalog or engineering assistance.

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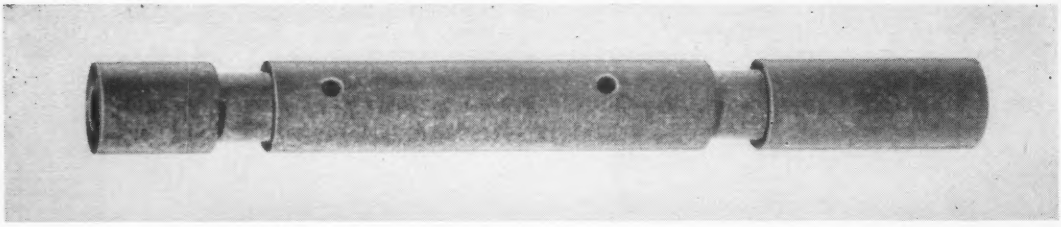
Support spacer rod: strength and heat resistance

Raybestos-Manhattan, Inc. has developed a Pyrotex support spacer rod to meet the temperature and structural demands of an automatic vending machine dispenser for hot liquids.

The rods (there are two in each machine) must support a stainless steel vat, its liquid contents and attached heating unit, with a total weight of 12 to 16 lb. Bolted to the inside framework of the rear door on the dispensing box, the rods reach temperatures as high as 800 F and reduce the flow of heat from the heating unit to the framework that supports the entire assembly. The rods provide exceptional heat insulation. Four studs on the heating element rest directly on the support spacer rods. The temperature where the studs contact them is approximately 800 F. The surrounding temperature (where there is no direct contact) is about 400 F. The outside dimensions are ½ in. diameter by 4⅞ in. long. There are two recesses on the outside diameter, each 5/16 in. wide and 1/16 in. deep. Two holes are drilled and tapped on the side of the rod and both ends are drilled and tapped.

Prior to selecting the Pyrotex rod, a Chicago vending machine manufacturing firm tested many insulating materials. These either weakened structurally under the continuous temperatures, or were structurally sound, but lacked insulating qualities. (209)



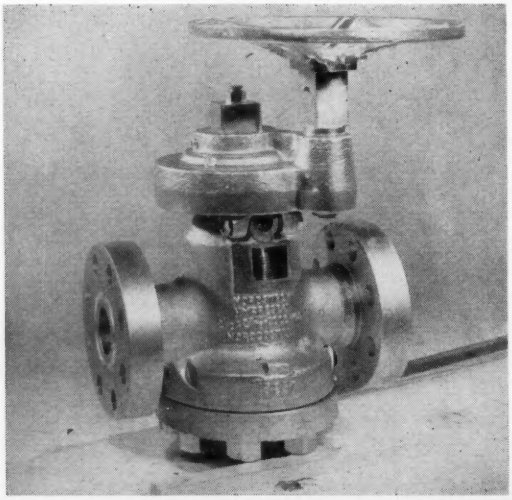
Gear operator: one turn opens or closes a valve

A lightweight planetary gear operator which adapts wrench-operated Rockwell-Nordstrom Hypreseal valves (used on high pressure service) to gear operation has been developed by the **Rockwell Manufacturing Company.**

Easily installed by one man, it has a 5-1 gear ratio and a 4-1 mechanical advantage. One turn of a wrench or handwheel will close or open the valve.

Developed primarily for valves already in service, the gear operator fits directly over the square plug stem and down over the body of the valve. No special wrenches or handwheels are needed with the gear operator, since the wrench normally used will fit easily over the operating pinion.

Attachment simply requires the tightening of a set screw on the valve plug stem and adjustment of two top screws which lightly contact the packing injector box. The plug stem projects through the gear operator, causing no interference with the valve's lubricating fitting. The assembly is offered in three sizes, depending on the size and working pressure of the valve. (210)



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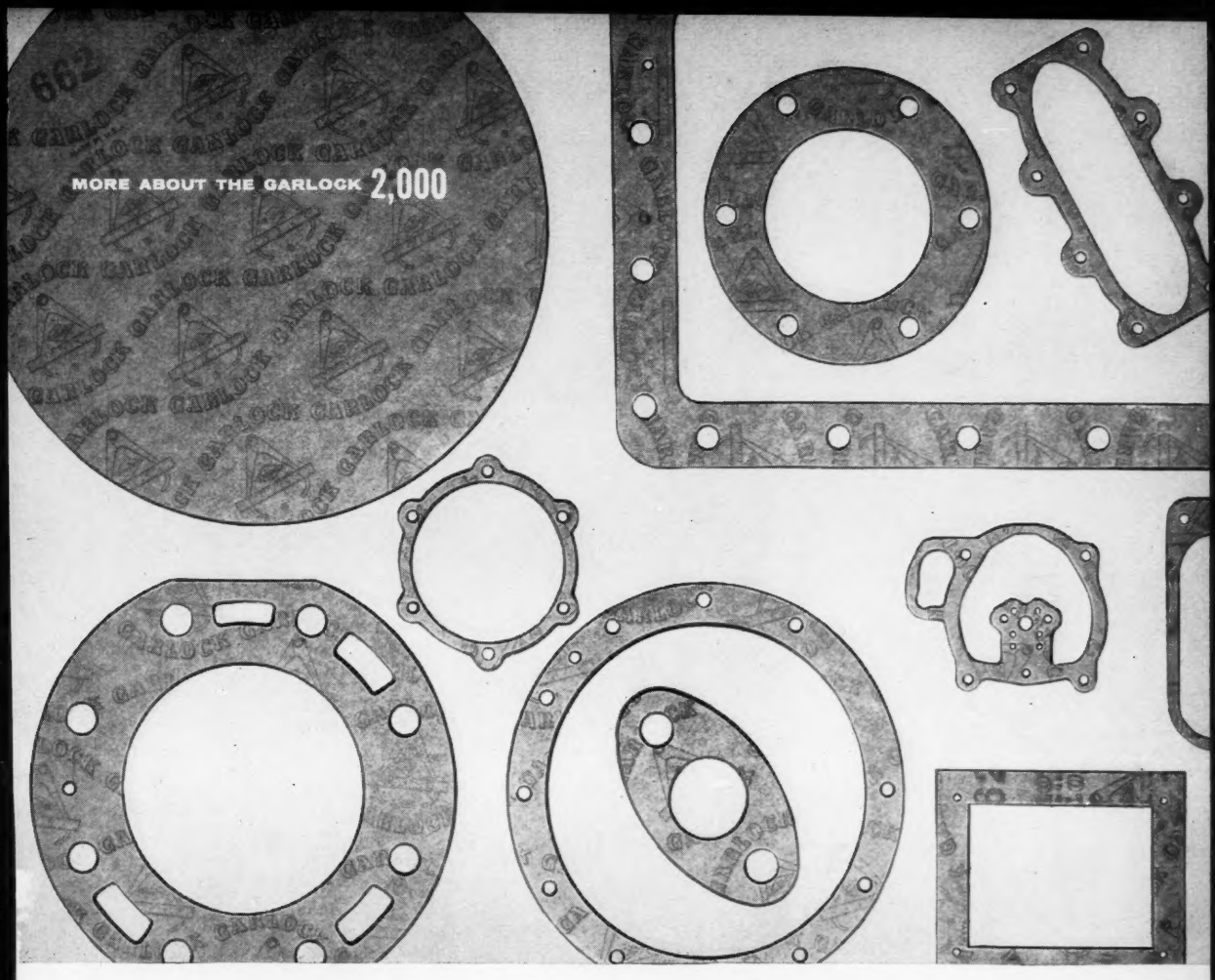

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662 is made from a cork paper base impregnated with BUNA-N. Does not contain glycerine and is approved by Underwriters' Laboratories, Inc. for use against hazardous liquids such as naphtha, benzine, fuel oils, etc. Available in 48″ wide rolls from $\frac{1}{64}$″ to $\frac{1}{8}$″ thick and in sheets 48″ x 48″ from $\frac{1}{8}$″ to $\frac{1}{4}$″ thick. Write for Folder AD-146.

Garlock 662, 681, and 660 Gasketing materials are another important part of the Garlock 2,000 . . . two thousand styles of packings, gaskets, and seals for every conceivable need. The only complete line. That's why you get unbiased recommendations from your local Garlock representative. Call him today.

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GARLOCK 681. Vegetable fibre compound with glue binders. Treated with glycerol. For sealing against oils, gasoline, solvents. Withstands moderate pressures and temperatures to 212° F. Sizes from .006″ to ½″ thick in 40″ widths. Write for AD-162.

GARLOCK 660. Granulated cork base with oil-resistant binder. Used where greater compressibility needed for irregular flange surfaces; for application involving low pressures and temperatures to 212° F. Sizes from .010″ to ½″ thick in 36″ widths. Write for AD-162.

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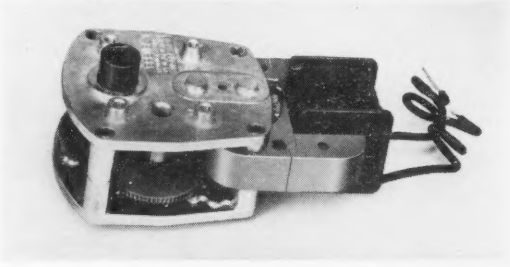
GARLOCK

Packings, Gaskets, Oil Seals, Mechanical Seals, Molded and Extruded Rubber, Plastic Products

Output shaft: the advantage of easy coupling

A new type of output shaft has been introduced by **Brevel Products Corp.,** manufacturers of low-cost fractional horsepower motors. Incorporated in the new spur gear motor, it permits coupling to the input shaft or rotating mechanism much more easily. The special design of the motor itself allows greater power in small space.

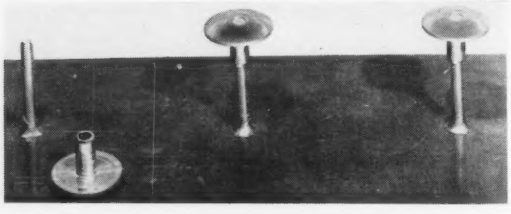
This new output shaft motor is just one of the many spur gear, worm gear and other types of motors made by Brevel, who specialize in slow-speed motion. Motors are designed to provide maximum efficiency at minimum cost. Standard motors with single or dual shafts, variable shaft lengths, speed and rotation are available to suit application. Special motors will be made to specifications. All are precision engineered for quiet, trouble-free operation. (211)



Stud cap: high-speed fastening of insulation

A threadless stud cap of aluminum alloy, with a positive interference lock for high retention strength, is available from **Huck Manufacturing Company.**

The cap is designed for use with special threadless steel studs and is available for either ⅛ in. or 3/16 in. nominal diameter. Various shank lengths are provided to permit application over a broad range of material thickness.



The studs with which the caps are used are not threaded, but have annular grooves. The cap is installed by tapping it onto the stud with a hammer. Optimum interference fit ensures positive cap retention in assembly. When used with studs having annular grooves manufactured to Huck design specifications, the new 3/16 in. cap, for example, will withstand removal forces as high as 130 lb.

Although designed specifically for installing insulation, the device provides a cheap, high-speed fastening method for other applications where the use of a fastener of moderate strength is satisfactory. The cap is fabricated of 2117 aluminum alloy. A head diameter of 1 in. provides a broad bearing area for the positive installation of a wide variety of materials. (212)

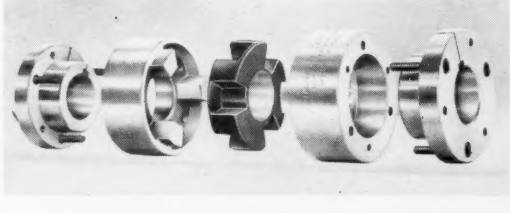
Flexible coupling: steel's strength in magnesium

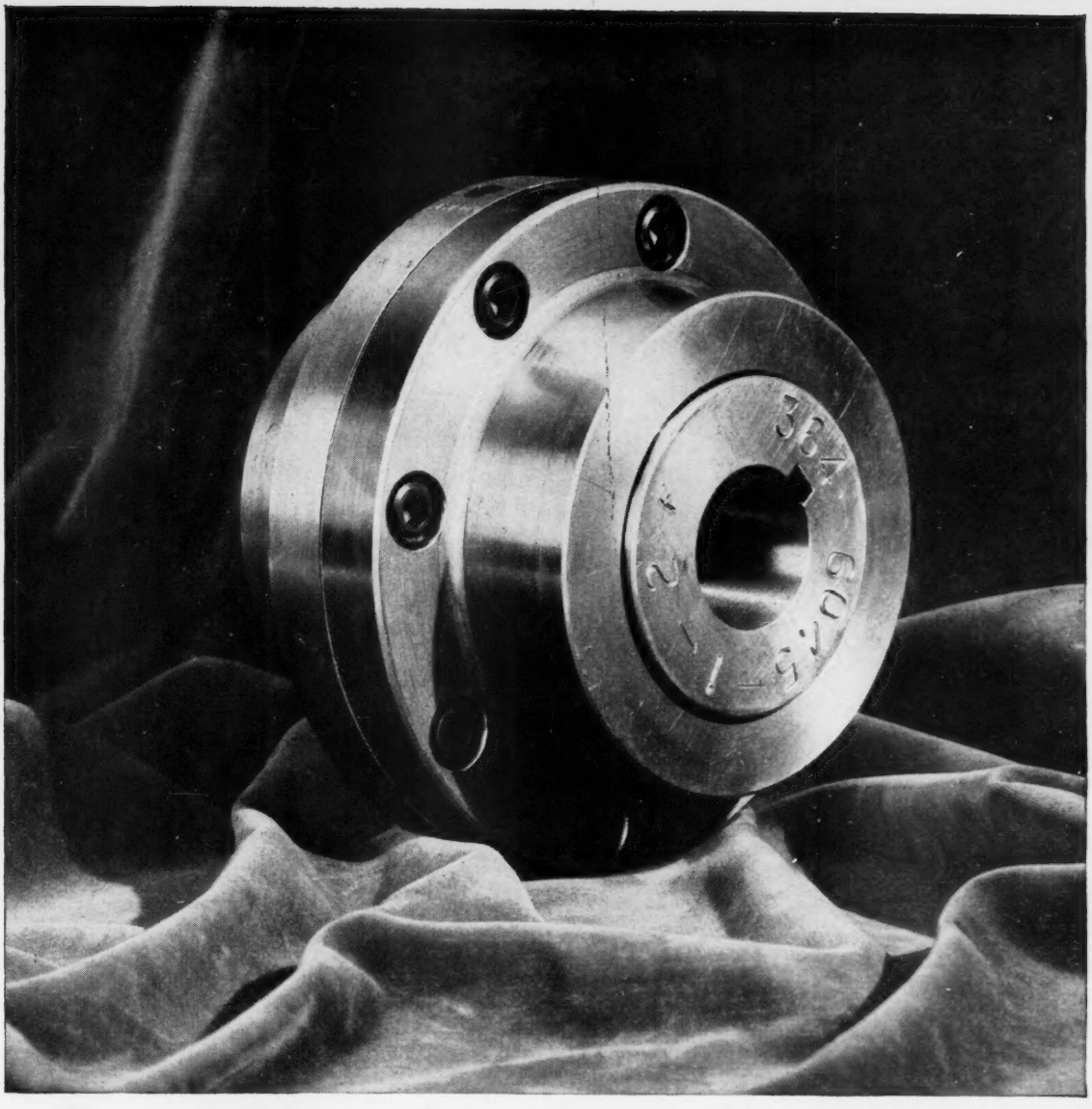
A line of flexible drive couplings (under the trade name Magnaloy) is made by the **Detroit Power Coupling Company.** These couplings are made entirely of a magnesium alloy that provides the strength of steel with an 80% reduction in weight. Low weight is valuable in reducing the vibration so damaging to motor and machine bearings.

The installation of these couplings is simplified since they are not pressed-on, but slipped over the shafts. They are made vise-tight through the use of separate split hubs, which fit into the coupling halves, much like a tapered tool shank in a holder. Socket-head screws are used to draw the two together and thus compress the split hub around the shaft.

Removal is accomplished by inserting the same screws in holes drilled only in the hub. The screw meets the opposing face of the coupling forces and separates the two. All hubs (regardless of bore size) are interchangeable in the couplings of each model size. The halves of the coupling are identical.

The drive is transmitted through a lugged neoprene drive insert, providing an insulated, non-lubricated connection, absorbing misalignment and shock. Made in eight size-steps, they will take ¾ to 6 in. shafts. (213)





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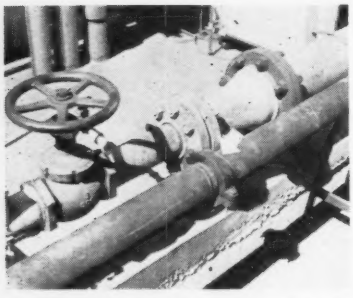


rated capacity exceeds the burst pressure of the pipe used.

The joint is designed to maintain a leakproof seal under the most adverse operating conditions in the chemical and oil industries. It lends itself to installation where working quarters are tight, requiring only two bolts to put together or take apart. (214)

Self-locking set screws

Self-locking set screws are now used by Whirlpool to fasten motor pulleys, brake pulleys and transmission pulleys on their line of automatic clothes washers and dryers.

These set screws have a small plug of nylon embedded in the threaded area of the fastener to prevent the screw from slipping out of adjustment under heavy vibration and impact.

The company decided to use these set screws after a test which simulated 10 years of washer life. After running a total of 1,752 hrs, the set screws still held firm. Two of the machines used in the test had the screws removed every 500 hours and reinstalled, simulating a repair job as proof of reusability. (215)

Plastic packing

Halocarbon Products Corp. announces the availability of Fluoropack, a non-gelling, putty-like packing material which is moldable under pressure to the contour of any stuffing box. It was designed for use on high-speed shafts as a seal which must retain corrosive liquids without leakage, heat build-up or shaft scoring. In more than 12 months of testing, it has performed well, even with worn and out-of-round shafts. It is self-lubricating and requires no external lubrication.

Fluoropack is composed of finely divided Teflon compounded with a blend of special fractions of polychlorotrifluoroethylene oil. While it contains a large proportion of the chemically inert oil, the packing will not bleed except under elevated temperatures and pressures. (216)

Relief valves

Cash-Acme Automatic Valves announces a series of temperature-only automatic relief valves. Designated the type TR series, they provide temperature protection for hot water tanks and heaters already protected by a pressure-only relief valve, since both pressure and temperature protection are necessary to

prevent explosions. Some codes and individual preferences call for two separate valves.

These valves are constructed of bronze castings with brass internal parts, silicone seat disc and a positive acting thermostat which opens the valve at 210 deg F and closes it at 180 deg F. Maximum pressure is 150 psi. (217)

New tracing material

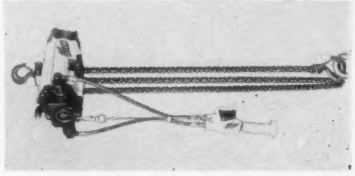
A new, low cost and highly durable tracing film for engineering tracings, architectural drawings, and type-on masters has been introduced by the Ozalid Division of General Aniline and Film Corp. Known as Duratrace, the material has an excellent surface for taking pencil and is superior in many respects to high quality, moisture proof, pencil tracing cloth, according to the manufacturer.

The tracing film is an excellent type-on master for whiteprint or offset reproduction. In addition, it may be employed with excellent results to combine polaroid transparencies with type material for such uses as real estate listings and illustrated specification sheets. It may also be used to produce superior projectable transparencies for visual aids. Cost for the new material is 15-20% lower than tracing cloth. (218)

Chain hoist

A 1,000-lb air-operated chain hoist, which weighs only 30 lb and raises half-ton loads at a rate of 50 feet a minute, has been announced by **Thor Power Tool Co.**

The hoist is powered by a reversible 8-blade air motor. The hoist is capable of lowering rates up to 96 fpm under

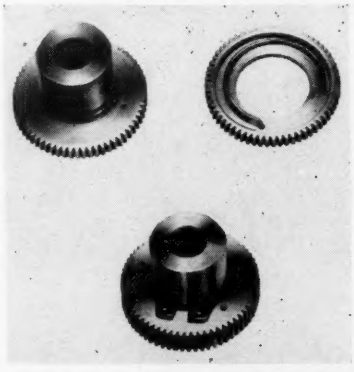


maximum load. Sensitive throttle control permits accurate spotting of loads and infinite graduation of load lifting or lowering rate from crawl speed to maximum speed.

The unit is available with two types of throttle control, manual nylon rope and pendant or remote control which permits one-hand hoist operation by means of a two-lever (lift and lower) throttle at hand height. The hoist is avaliable with roller or link chains and with hook or trolley mounting. (219)

Miniature gears

Anti-backlash gears are now available in 6 popular diametrical pitches, 5/8 in. to 1 in. outside diameter from Dynamic Gear Company, Inc. Both solid pin type and clamp type hubs are offered, to-



gether with a choice of 3 different bore sizes.

These miniature gears feature an internal helical spring and fill another gap in the constant search for miniaturization. (220)

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FOR POWER CONTROL DESIGNS

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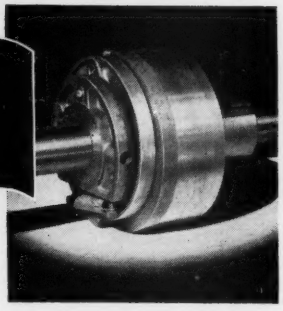
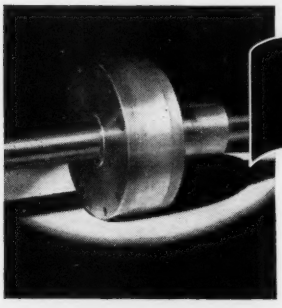


Unequalled for accurate control of intermittent machine operations — cutting, punching, and packaging. Gives closer tolerances to cut-off, stamping, shearing, and similar machines. Completely automatic; manual, mechanical, or electrical control.



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CLUTCH

Hilliard Over-Running Clutches and Couplings are automatic in operation. They are unexcelled for automatic two-speed drives, dual drives, stand-by drives, and for allowing machinery to "coast" after drive stops. Excellent as fixed or infinitely adjustable ratchets.

HILLIARD
SLIP
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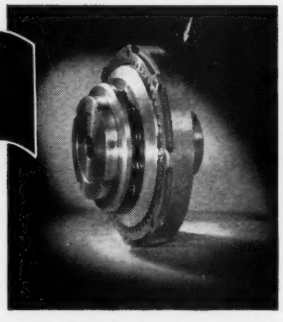

A reliable series of spring-loaded slip clutches and couplings. Rugged construction with ample friction surface for heavy-duty use. Outstanding for preventing overloads and shocks; for starting heavy loads; as tension drag brakes; for reeling and winding operations; and many other uses.

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Many difficult bearing problems are solved by Hartford engineers. For example, through unitization of parts, miniaturization and reduction in tolerance build-up is achieved with VERSA-TWIN, a double-row ball bearing in which parts of the end product form the inner and outer races. This bearing can be custom designed to your specific requirement.

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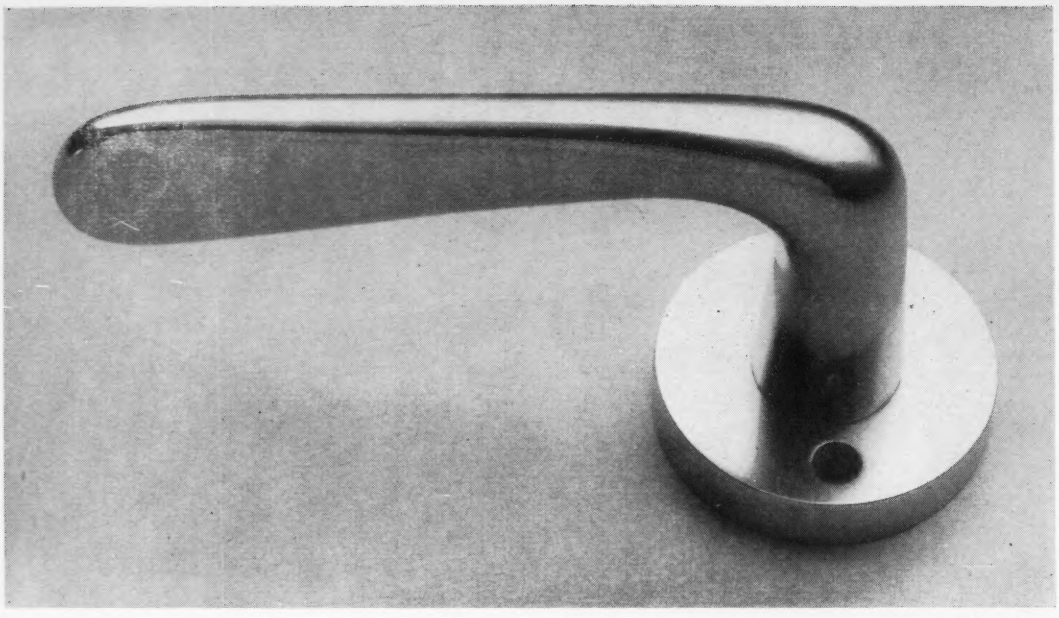


1. In anodized aluminum, brass, bronze or nickel silver, this door handle comes in many colors and finishes.

U.K. design—forward or marking time?

"The time saved from the struggle to stay at the very front they have

John W. Dennis ASSISTANT EDITOR

In London's Haymarket, a stone's throw from Piccadilly Circus, are the offices and showrooms of the Council of Industrial Design. Known as the Design Centre, the building houses an organization which closely parallels Canada's National Industrial Design Council with its offices in the Design Centre on Mackenzie Avenue in Ottawa.

Through these UK showrooms pass the best in British manufactured products — best on the three counts of function, appearance and the use of materials. Where, if anywhere, can one find the fine line that will distinguish the Canadian from the UK design?

One of the examples (the toaster in fig. 2 on the next page) is as British as Manchester rain. The easy recognition is possible, however, not because it is a distinctly British design, but rather because it is a pleasing design of an article peculiar to a country where breakfasters like to eat toast from a rack in which it has (to the amazement of North American cousins) been allowed to stand and cool. The basis of recognition is not a valid one from a design point of view.

This meshing together of design trends has always occurred in times when there has been a strong international character which has rubbed the sharp edges from a well-defined national trend. This has happened now. The same could be said of the Regency period. To find differences one must look more closely, to such things as the use of materials and to their finish.

We think that a quick look at a few of these UK designs in detail will be interesting to our readers. Some of them (the lightfitting, the slide viewer, the toast rack and the knifecut pruner) were among twenty items chosen as "Designs of the Year, 1958" and the UK retail price, in its equivalent in Canadian dollars, has been included for all of the items except the door handle (fig. 1) and the glass studio (fig. 7). These prices, although hard to relate directly to the Canadian market, nevertheless serve as a basis for assessing the suitability of the materials that were used. All prices quoted are less purchase tax.

The door handle in figure 1 is available in a number of metals, namely anodized aluminum, brass, bronze and nickel silver. Coming with a satin finish, it can also be purchased in nickel or chromium plate. Colors include silver, bronze, brass and so forth. It was designed in the studio of its Wolverhampton manufacturer.

Figure 2 shows the previously mentioned toast rack. Its approximate dimensions are a height of 2½ in. and a width and length of 2½ in. and 7½ in. respectively. The metal is stainless steel which is available with either a satin or mirror finish. One of the award-winning designs, the judging panel's comments were ". . . ingenious construction in an increasingly popular and eminently suitable material . . . a good step forward in an industry in which the imitation of older forms in other materials has been more common than original thinking." Price: $2.94.

The slide viewer in figure 3 was another award-winner. Here the judges commented ". . . well thought out to give a pleasing and workmanlike appearance but

on some models criticism can be made of the slight inaccuracies in the junction of the screen molding with the upper casing."

The viewer retails for $55.86 and the lamp adds a further $2.31 to the complete unit. The cover is of self-colored (ivory) polystyrene and the grey base is a phenolic molding. The viewer takes 35mm transparencies and projects them up on to an 8 in. by 8 in. screen through a matched optical system with fully corrected f2.8 lens. Using a 100 watt lamp, the unit will operate from ac or dc mains and has height, depth and width of 13 in. x 11 in. x 10 in.

In judging the pruner (fig. 4) the award panel said "Great attention has been paid to manufacture and finish and to such details as the unusual but practical single-handed locking device. It is a fine example of precision engineering designed with the assistance of an artist who is also a gardener."

Selling for $7.00, the pruner has steel blades with a chromed, rust-resisting finish. The handles are light alloy, stove enamelled grey. The cutting blade is precision ground and the holding (or female) blade possesses a sap groove which prevents clogging and preserves the cutting blade. Two adjustable floating bearings prevent twisting when cutting through wood. Length 8½ in., width 2¼ in., weight 12 oz.

Figure 5 shows a line of spiral and ratchet screwdrivers all made by the same manufacturer. On the spirals, all exposed parts are nickel or chromium plated against rust. The ratchets are of chromium plated tubing and the blades are polished steel. The small, ratchet-only screwdriver in the centre of the picture has a chromium plated blade and tube.

The spiral screwdrivers will drive or withdraw screws automatically when thrust forward and the two at the bottom of the photo are supplied with a spare blade and three drills for wood, light alloys or plastics. These are stored in a transparent plastic handle of "Tenite". The ratchet screwdrivers can be held in one position while screws are being driven or undriven. Flexing of the wrist moves the ratchet mechanism so that the blade can be moved after each movement. Prices range from 98c for the small, spiralless driver up to $4.06 for the largest in the line.

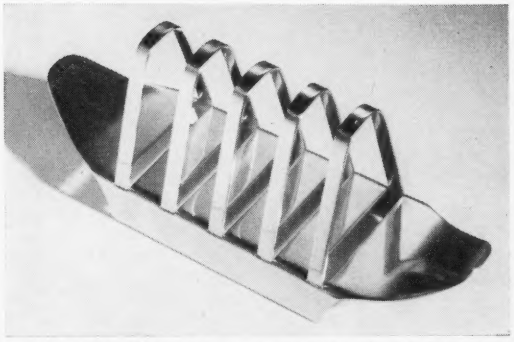
The first photo over the page (fig. 6) is of a portable convector heater. It has a 24-gauge sheet steel casing, stove enamelled in satin black and cream. Other colors are available. The element frame is of corrosion-resistant zintec and the close mesh expanded metal element guard is of aluminum. The handle is plastic.

Weighing 8 lb., the unit measures 26 in. x 12 in. x 7½ in. and is suitable for voltage ranges: 200/220, 230/250 ac or dc. It has a 750 watt consumption. Retail price: $9.66.

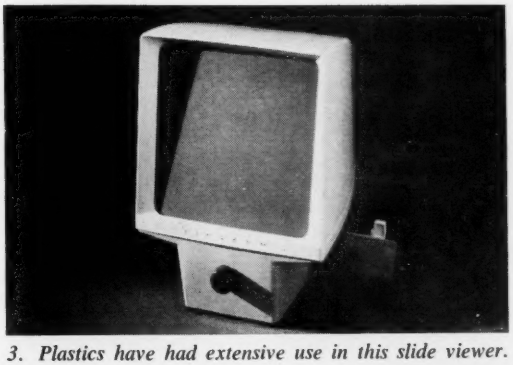
The experimental glass studio shown in the next picture (fig. 7) is the work of one of the assistant architects now working on the new cathedral at Coventry. The studio stands in Hugh Pope's garden and was put up with the aid of his wife and a friend in two days. It is made entirely of glass with a light timber frame and the interior is lined with panels which can be taken out or put in according to the weather or the lighting wanted. The frame has 150 separate triangles.

Pope believes that this construction (a sort of geodesic dome) will find a big market in buildings of

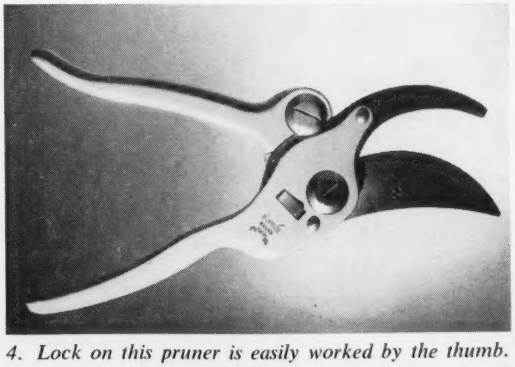
channeled into much greater attention to good and careful detail work"



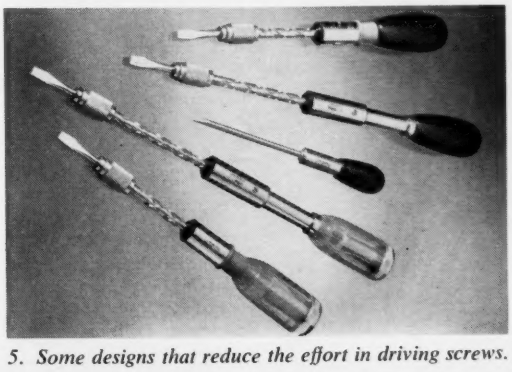
2. Truly British, this toast rack is of stainless steel.



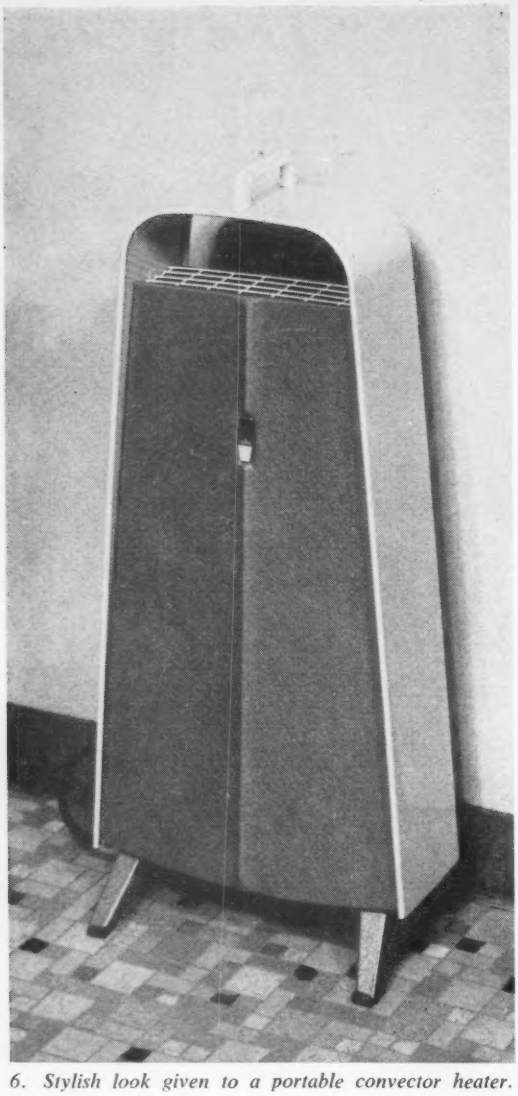
3. Plastics have had extensive use in this slide viewer.



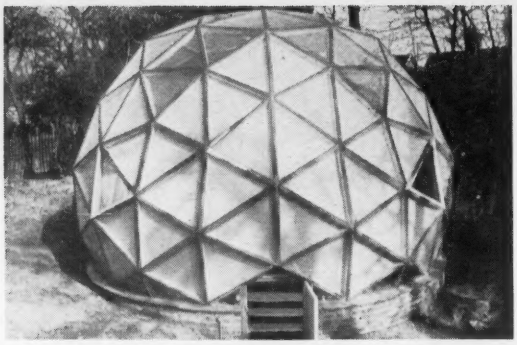
4. Lock on this pruner is easily worked by the thumb.



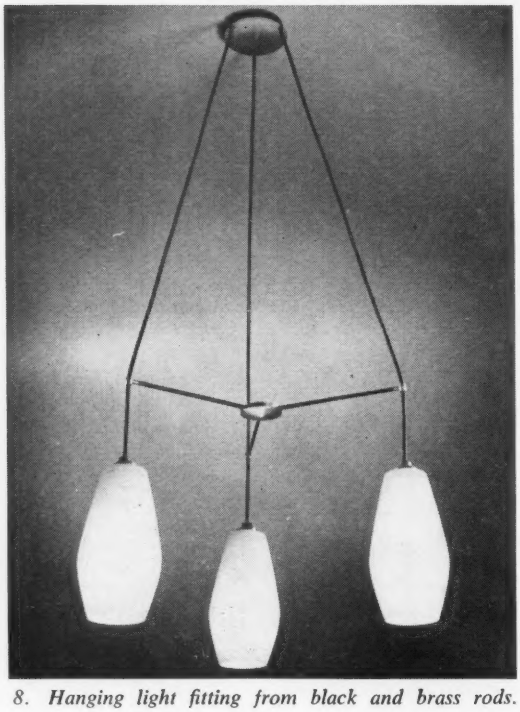
5. Some designs that reduce the effort in driving screws.



6. Stylish look given to a portable convector heater.



7. Studio with 150 triangles of glass framed in wood.



8. Hanging light fitting from black and brass rods.

You find the national design differences in the details of an item

the future and particularly in churches. Required materials are easily transported and can be assembled with more speed and less expense than traditional constructions.

The three-light pendant lighting fitting in figure 8 is the last of the four award-winners we have illustrated. Here the panel said "The judges have chosen this range of pendant fittings and this particular shade for the quality of the satin-finished glassware (which is attractive both lit and unlit), the delicacy of the bracket arms, the unostentatious use of brass in combination with black rods and the general elegance of the range in all sizes. Ease of assembly and accessibility for cleaning and lamp replacement have also been considered carefully in these designs."

The shades are satin finished flashed opal glass in white or pink and the pvc flex comes in black or white. The unit is designed to hold three 75-watt lamps, is 4 ft. high and weighs 6 lb. Retail price in England (in Canadian dollars) is $19.46 with the pink glass for the shades, if specified, adding a further $1.54.

Although in certain areas, such as housewares, the design of British items may seem to lag behind their North American counterparts as far as newness goes, they nevertheless possess an indefinable air of compactness, suitability for the job required and rightness of material used. The latter is sometimes achieved at the sacrifice of price-appeal unfortunately. Gimmick design solutions haven't flourished as strongly as they have over here, resulting in an over-all design atmosphere which, although not stodgy, is very definitely earth-bound. The time saved from the struggle to keep at the very front appears to have been channeled into a greater attention to good and careful detail work.

Pictures courtesy the UK Council of Industrial Design

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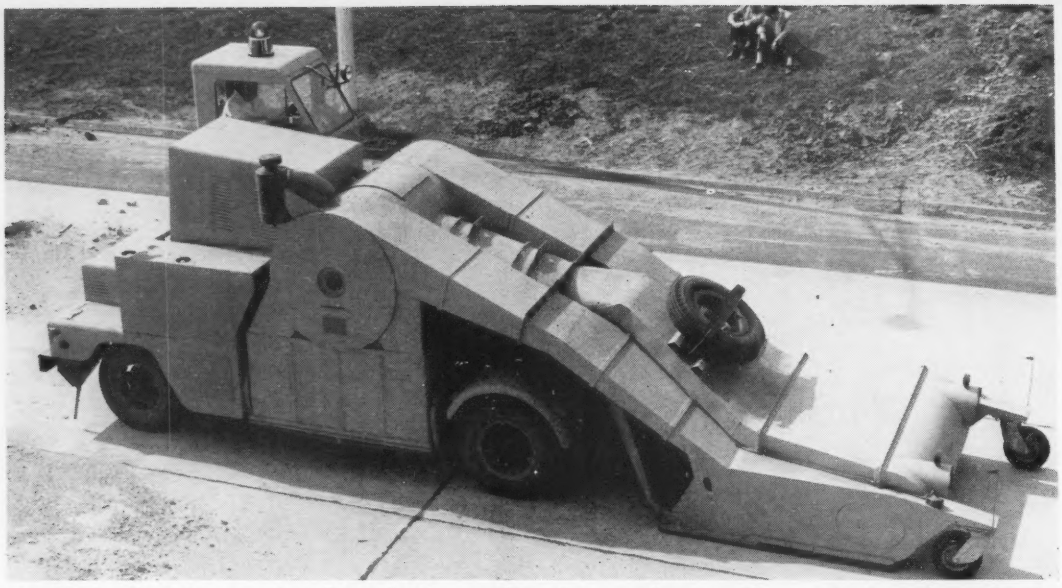
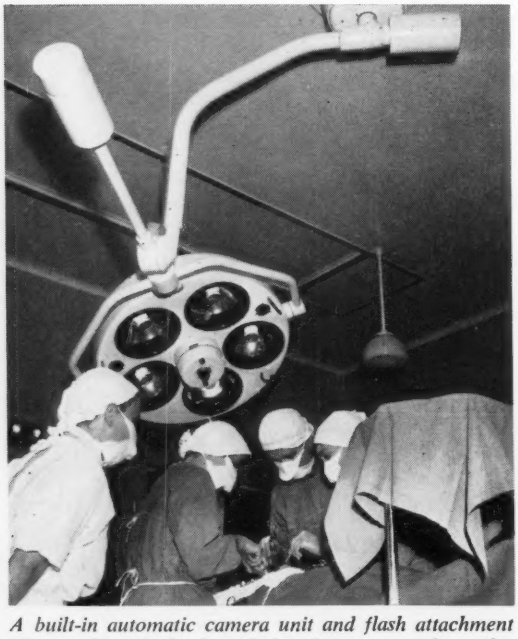
Briefly noted

The development by a team of Ottawa surgeons of a stitcher to reunite severed blood vessels. Using a principle similar to an office stapler, the device employs tantalum wire . . . that an Ontario company (Otaco Ltd.) has been awarded the US Navy's Certificate of Merit for outstanding performance in supplying heavy-duty sleds for Navy use near the South Pole. . . . an endorsement by Ontario's Minister of Health of units which can fluoridate the water in individual homes . . . that Britain has "perfected a color television system. All the BBC needs now is the Postmaster General's approval for a go-ahead . . . the use of plastic in the heels and welting of shoes being marketed . . . claims by British research scientists to have developed a super steel which is estimated to be "twice as strong as the metal used in Russia's sputniks." After toughening by refrigeration it can withstand more than 120 tons/sq. in. . . . a Scottish engineer's announcement of a process which, he says, will cut friction almost to the vanishing point. A loom so treated has been running for over three months without oil although the spindles normally require lubrication every two hours . . . the use by a Canadian boat company (Chestnut Canoe Co.) of an autoclave for baking laminated mahogany boat hulls . . . a new engineering material (by Du Pont) known as "Delrin" acetal resin. Not commercially available as yet, it promises high strength, good fatigue life, low creep and excellent solvent resistance. . . . that Australia, England, Canada and U.S. are trying to agree on a standard measurement for the inch. The differences, which amount to less than a hundred thousandth part of an inch were unnecessary until missile manufacturers started requiring accuracies of one millionth of an inch . . . that a Japanese noodle maker has perfected a typewriter which types Braille and the English alphabet simultaneously . . . that the U.K. has a television tube which, in the 21-in. size, is only 5 in. deep . . . the formation of a Canadian Astronautical Society for the advancement of all branches of scientific study in the field of space travel . . . the development, in England, of a process to reduce (if not entirely eliminate) the formation of white rust on galvanized steel sheets . . . . the 1958 Iron and Steel Exposition will be held in Cleveland Public Auditorium September 23-26 . . . that Canada Iron Foundries has purchased three structural steel companies in Western Canada . . . a new ultrasonic device has just been proved under ocean tests conditions to be able to keep a ship's hull clean of all forms of marine growth . . . a prediction by Gwilym A. Price, chairman of the Westinghouse Electric Corp., that the typical home of 1977 will utilize a heat pump for all-weather comfort.

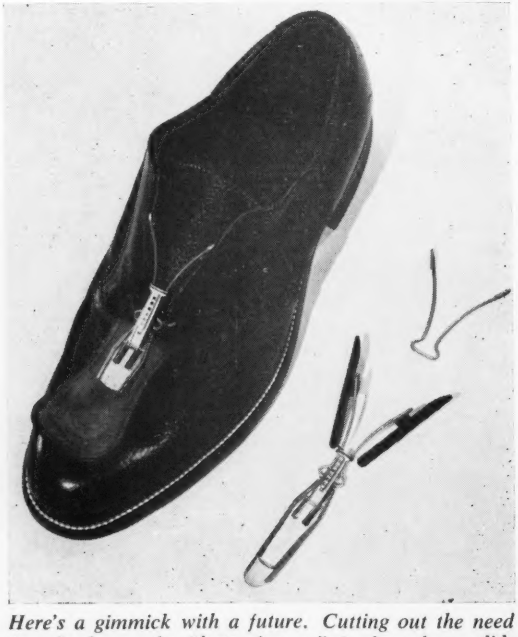


Too big for the living room broadloom, here's a machine that can clean a million sq. ft. in an hour. Leaving an 8 ft. wide trail of clean pavement, this monster has been ordered by the USAF to clear debris from aircraft runways and ramps used by jet planes. These suffer when they suck in wire, nuts and bolts and like items. (200)

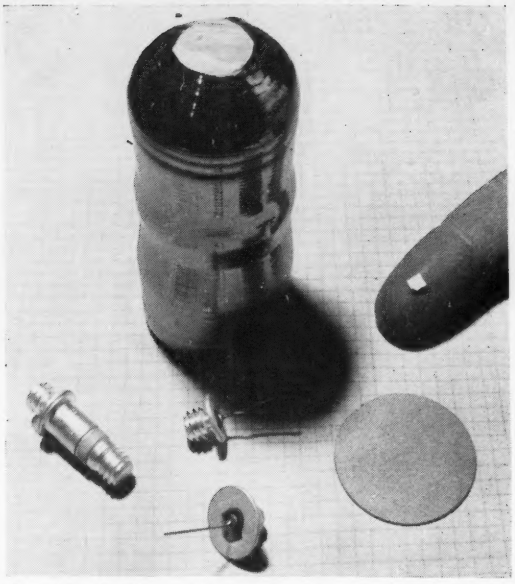
Design news in pictures



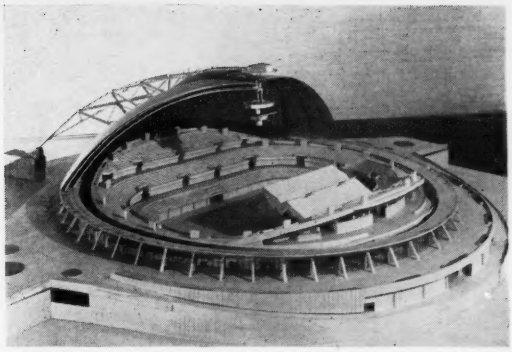
A built-in automatic camera unit and flash attachment allows this shadowless light fitting to take color photos from a surgeon's-eye view of operations. (201)



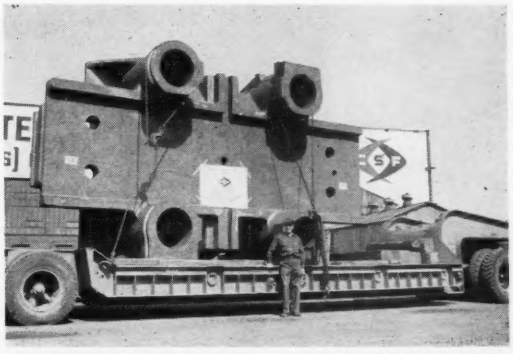
Here's a gimmick with a future. Cutting out the need for shoelaces, the "buttoning up" is done by a slide that runs along a stainless steel wishbone spring. (202)



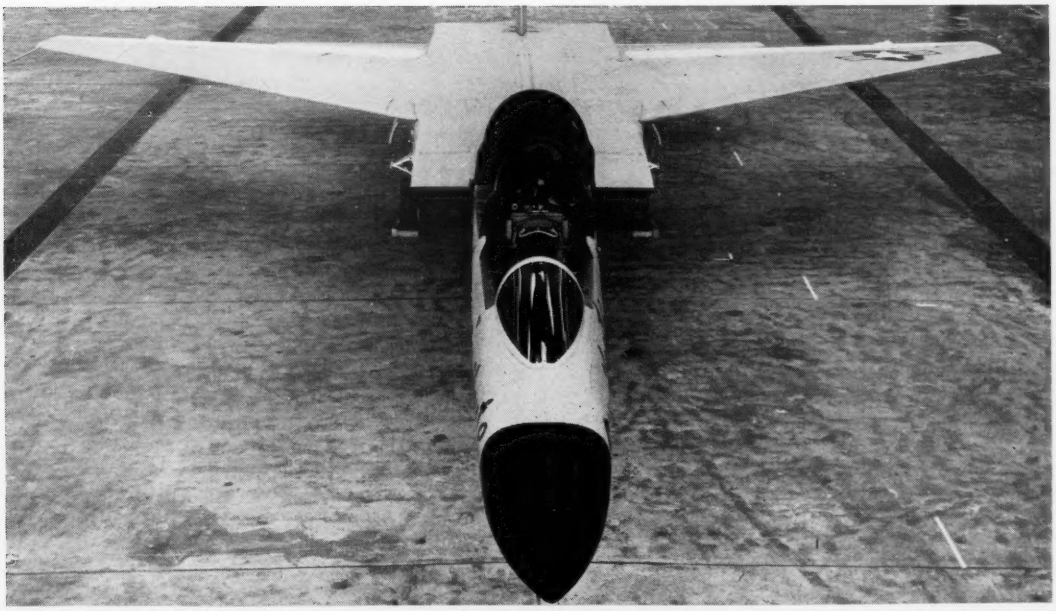
On that forefinger is a tiny dice of silicon crystal. At the top is the original crystal and below the finger a slice from it and the complete rectifier units. (203)



Pittsburgh's civic arena will have a stainless steel dome in eight sections, six of which will be movable and able to retract to make an open air stadium. (204)



The heaviest steel casting ever produced in Canada is the boast of this one. It had a rough pouring weight of 330,000 lb. and is part of a 6,000 ton press. (205)



The Vigilante, an all-weather attack aircraft to be based on U. S. carriers gives an impression of all-nose and no-wings. The plane is designed to deliver a wide variety of ordnance (including nuclear weapons) to sea or land targets in any weather. Plane will take its first flight this summer crewed by a pilot and navigator. (206)

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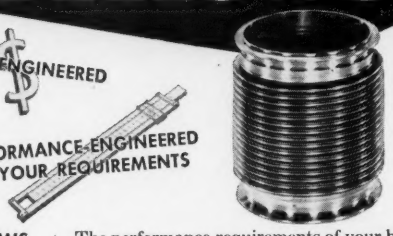

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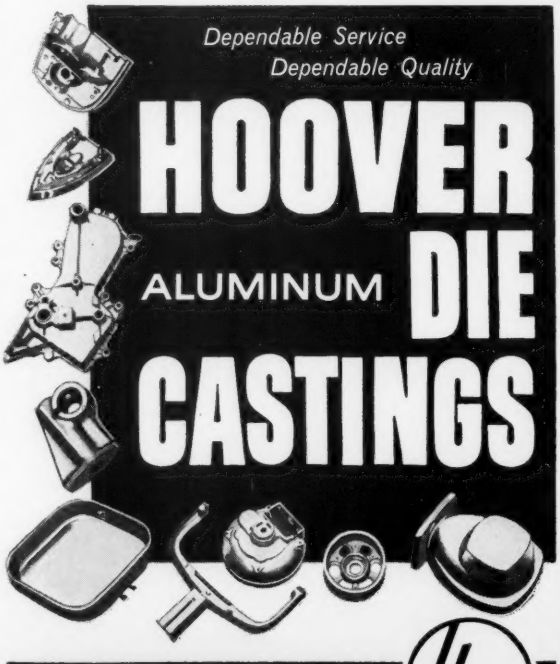

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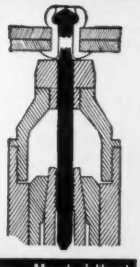
Photograph of POP RIVET application

Rivet and Tool in Position Before Setting



After Setting—Mandrel Head Retained

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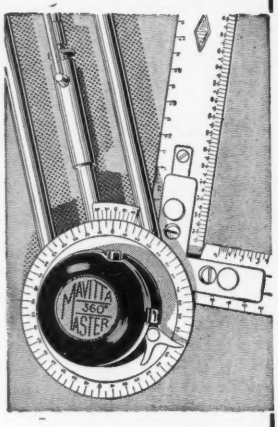

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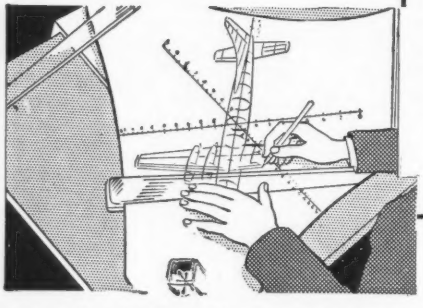

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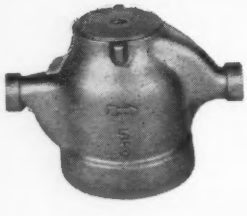

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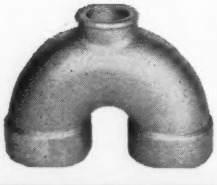

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Advertising Index — August

Editorial

Strong words on Canadian research

Research and Development

"We are too prone to accept unchallenged the research results of our U. S. neighbor. Research is our most urgent need. If Canadian industry were to adequately fulfill the need for research, I am sure Canada would soon achieve world leadership."

These strong words were spoken by J. Carl Wilson, president, J. A. Wilson Lighting & Display Ltd., at the official opening of their illumination research laboratory.

We understand that over 2% of every sales dollar in that company is spent on research for new and better lighting products, a policy that has paid off handsomely, as it would for other Canadian companies.

Unfortunately, Canadian industry as a whole spends less than one half of 1% on research.

Research company formed

In view of these remarks it is interesting to hear of the formation of a private research company, possibly the only one of its kind in Canada.

Known as Waterloo Research Institute, it is the result of four months' work by five faculty and staff members at Waterloo College.

It aims to develop new products and processes, improve existing products through research and analysis. In short, to help the industrialist improve his products by providing research, development and consultation facilities.

Russian technicalities

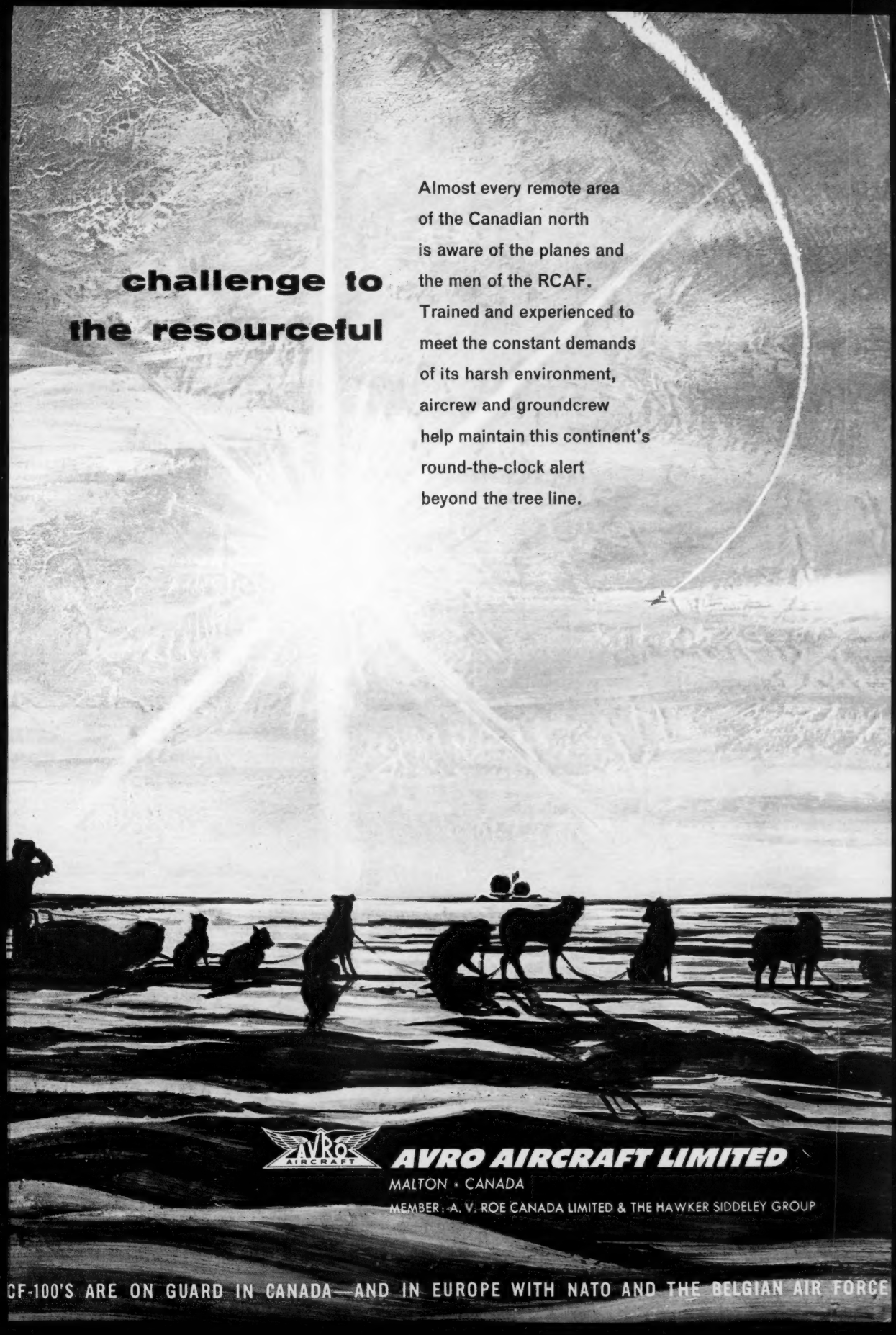
So phenomenal has been Russian technical progress in the last few years that it behoves the engineer to make a careful and systematic study of their literature.

This will be made somewhat easier by a forthcoming issue of "Mechanical Engineering" (the ASME Journal) which will give details of the Russian alphabet and a concise vocabulary of Russian technical terms.

Many of the newer terms, it is explained, are the same as in English. An engineer who knows his Russian alphabet will thus recognize words like: coefficient, anemometer and atomic. Older words (such as water, air and heat) have strictly Russian spellings, however.

Perhaps the day is not too far away when Russian will be taught in Canadian technical colleges.

William Morse.


challenge to
the resourceful
Almost every remote area
of the Canadian north
is aware of the planes and
the men of the RCAF.
Trained and experienced to
meet the constant demands
of its harsh environment,
aircrew and groundcrew
help maintain this continent's
round-the-clock alert
beyond the tree line.
AVRO AIRCRAFT LIMITED
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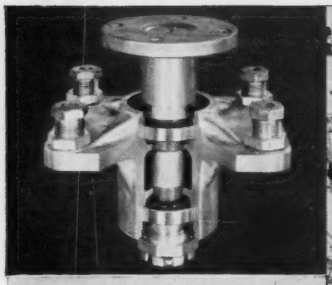
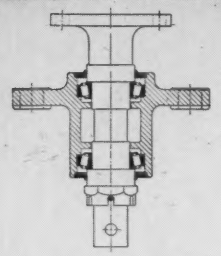
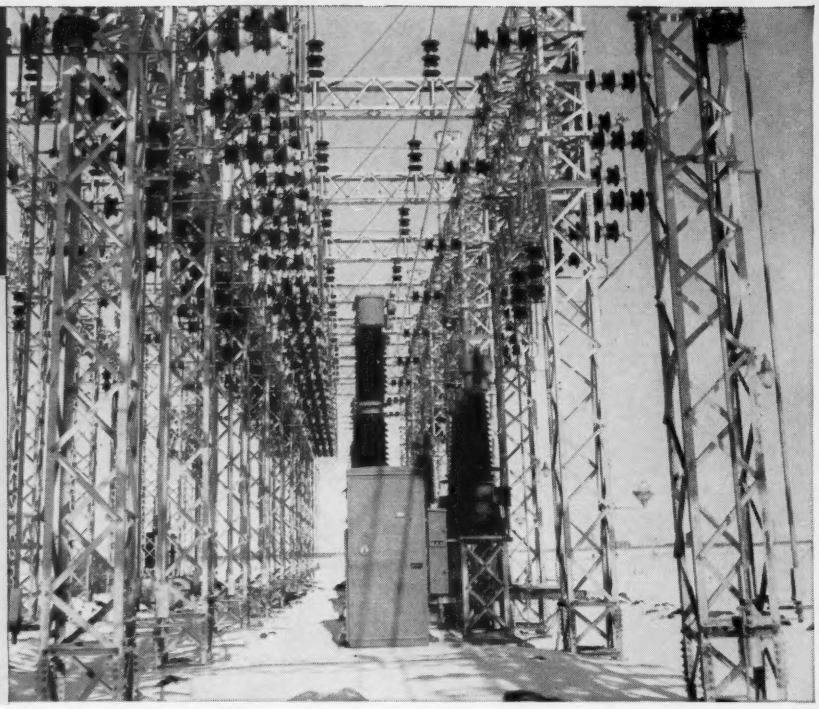
CF-100'S ARE ON GUARD IN CANADA—AND IN EUROPE WITH NATO AND THE BELGIAN AIR FORCE





How **JAMES R. KEARNEY CORP. OF CANADA LTD.** mounts the base of its type KDHB outdoor disconnect switch on Timken bearings to assure positive performance, take heavy loads.



New switch in bearings! 230 TIMKEN bearings make right connections, under heavy loads, in any weather

THIS Kearney type KDHB disconnect switch does the vital job of making and breaking power circuits, making it possible to deliver power when and where needed. And it has to do it under all weather conditions—can't stick in snow or ice. All this, plus the heavy loads when the switches are mounted vertically or at an angle puts heavy demands on the bearings in the switch base. To assure trouble-free operation, James R. Kearney Corp. of Canada Ltd. specified two Timken tapered roller bearings for the rotating stack of each single pole switch. Some 30 three-pole switches are shown in the installation above.

Timken bearings assure easy switch rotation because they roll true, practically eliminate friction. Seizure won't occur. And they're adjustable—can be set to the most desirable setting for this kind of oscillating service. The taper and design of Timken bearings lets them take static as well as both radial and thrust loads in any combination. And full-line contact between rollers and races gives Timken bearings extra load-carrying capacity.

With Timken bearings closures are more effective, too. Dirt, dust and moisture stay out. Lubricant stays in. Condensation doesn't form to cause corrosion.

We even make our own electric furnace fine alloy steel, to be sure it's the best. For all these advantages, specify bearings trade-marked "Timken". The Timken Roller Bearing Company, Canton 6, Ohio, U. S. A. **CANADIAN PLANT:** St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.

TIMKEN *Made in* **CANADA**

TRADE-MARK REG. IN CANADA AND U.S. PAT. OFF.

TAPERED ROLLER BEARINGS

NOT JUST A BALL ○ NOT JUST A ROLLER ⊂⊃ THE TIMKEN TAPERED ROLLER ⊂⊃ BEARING TAKES RADIAL ⊂⊃ AND THRUST —⊂⊃— LOADS OR ANY COMBINATION —⊂⊃—